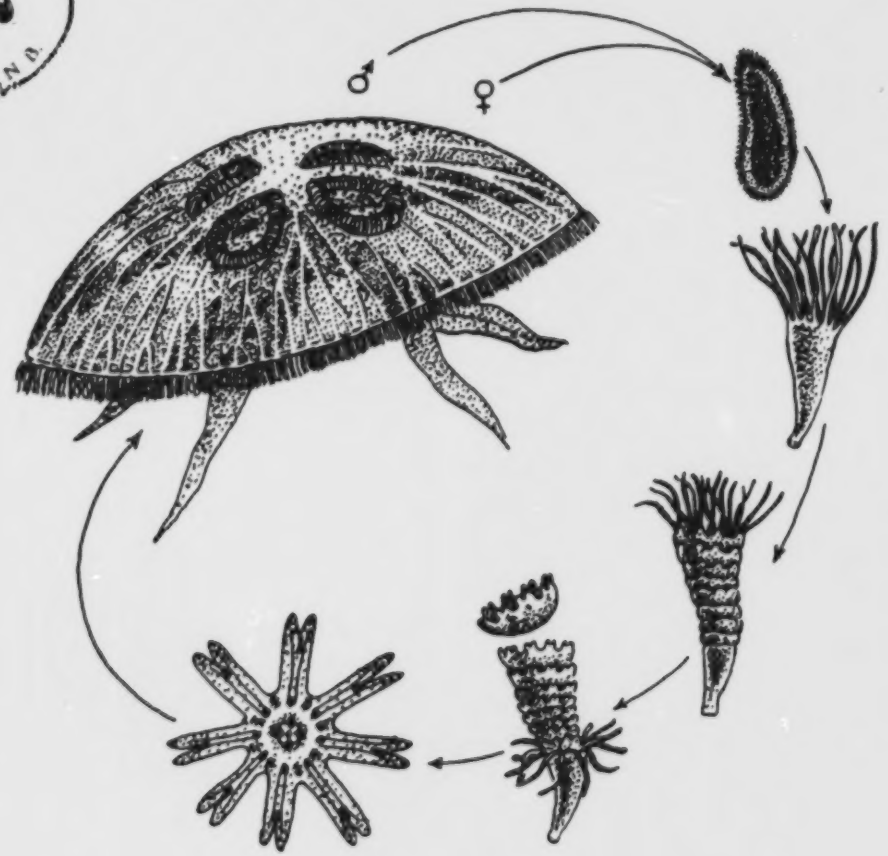
Bay of Fundy Resource Inventory

LEGISLATIVE LIBRARY
AUG 27 1979
FREDERICTON, N.B.



PEA POINT TO POINT LEPREAU

FINAL REPORT TO THE NEW BRUNSWICK DEPARTMENT OF FISHERIES, FREDERICTON, N.B.

MARINE RESEARCH ASSOCIATES LTD., LORD'S COVE, DEER ISLAND, N.B., CANADA

FINAL REPORT
TO
THE NEW BRUNSWICK DEPARTMENT OF FISHERIES

BAY OF FUNDY RESOURCE INVENTORY
VOL 6
PEA POINT TO POINT LEPREAU

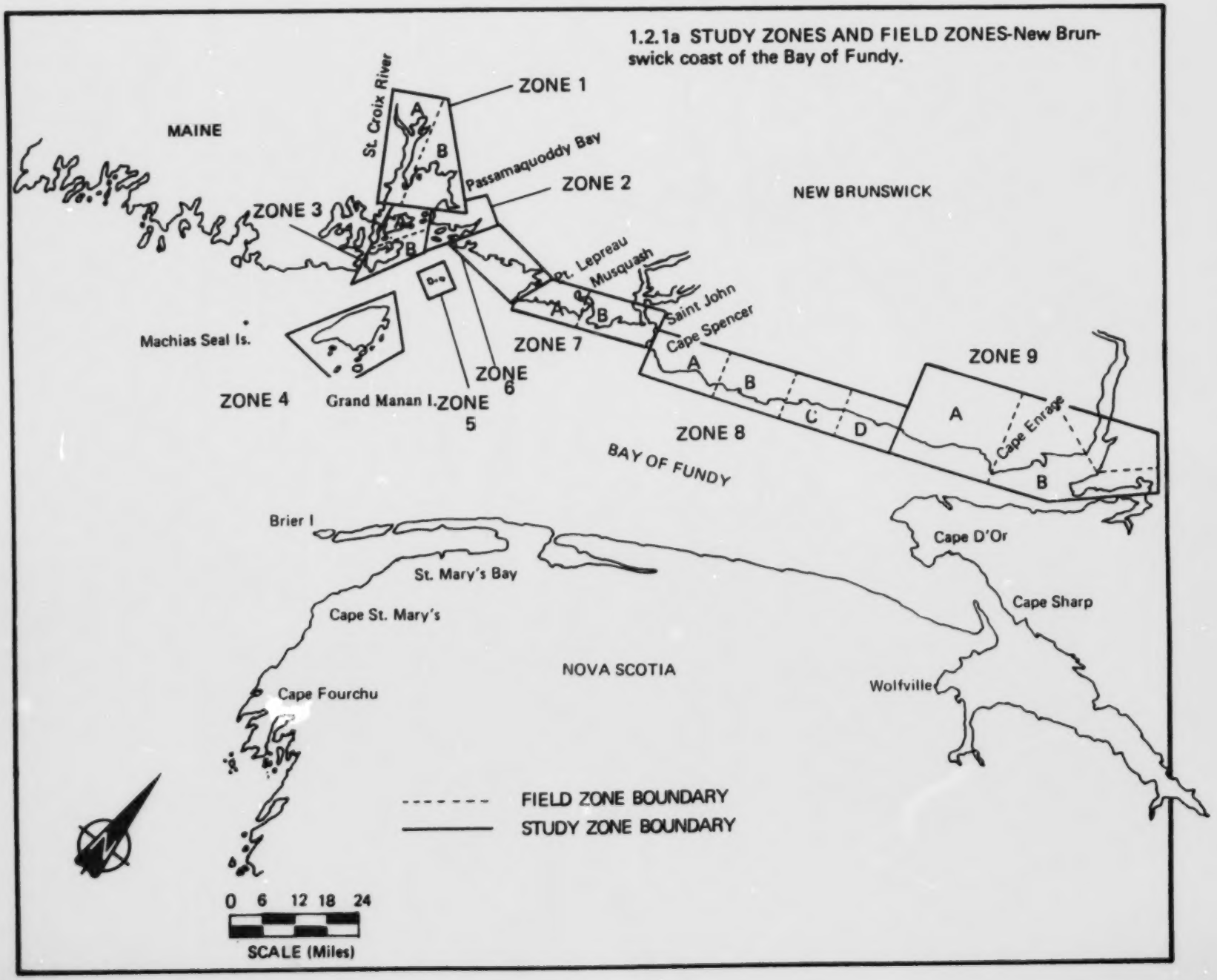
Arthur A. MacKay, Robert K. Bosien & P. Leslie
MARINE RESEARCH ASSOCIATES LTD.
Lord's Cove, Deer Island, N.B.
Canada E0G 2J0

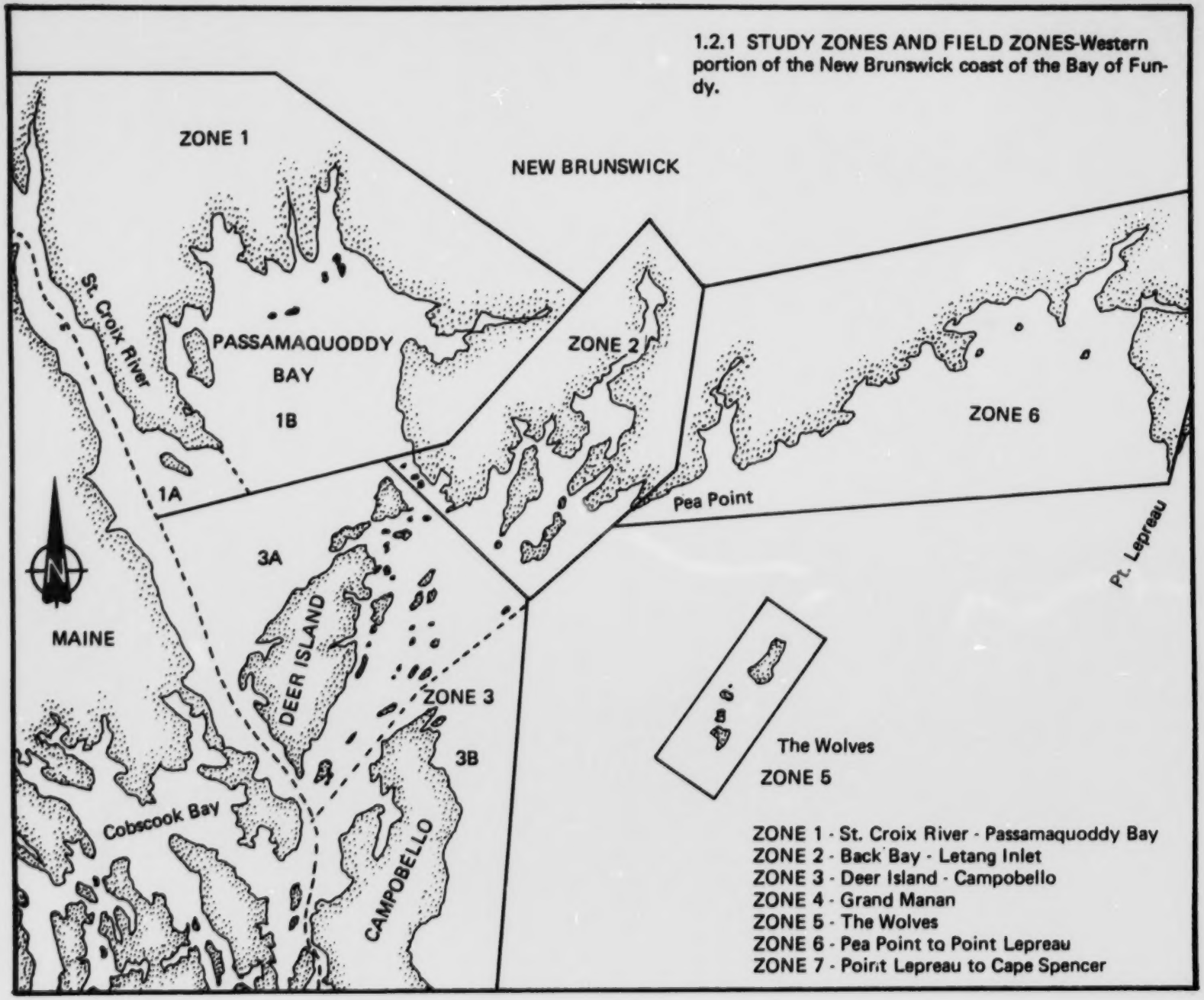
Reference NB78-1C
Dated: March 31, 1979

TABLE OF CONTENTS

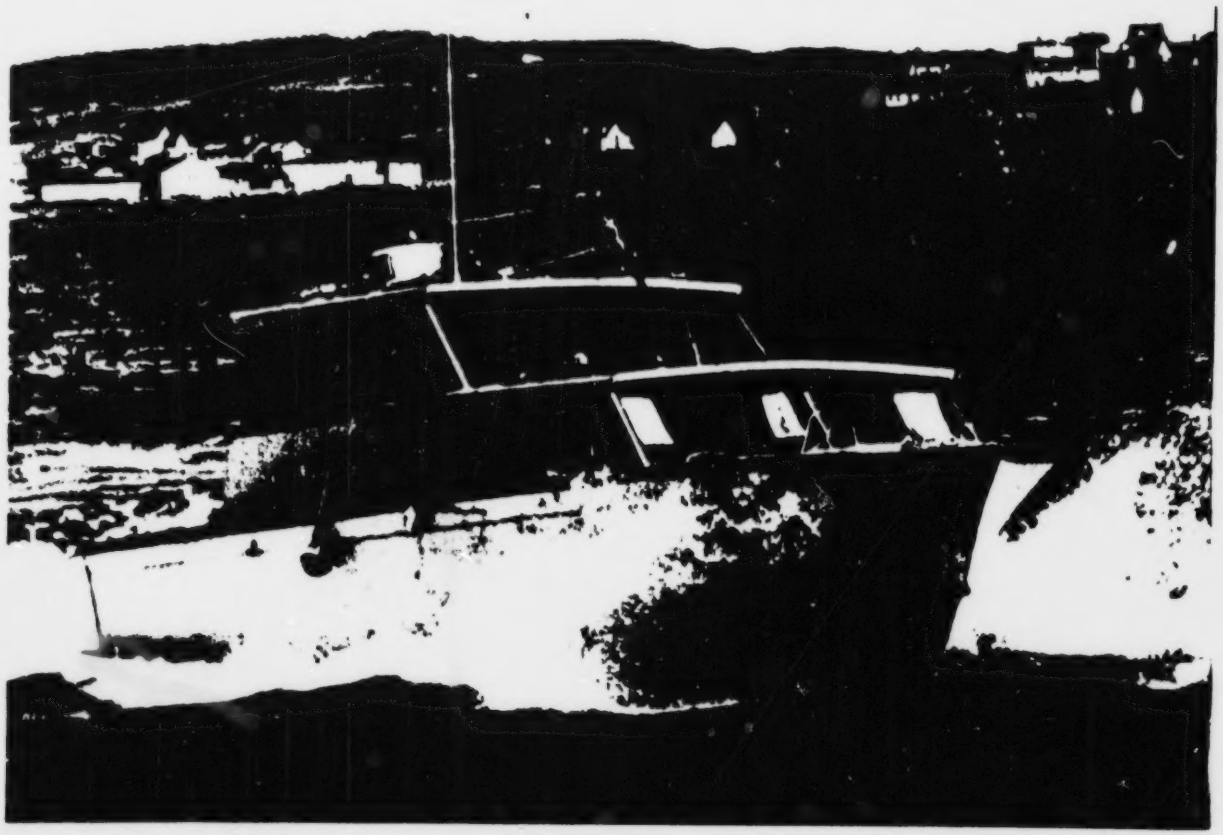
		PAGE
1.	INTRODUCTION AND OBJECTIVES	3
2.	METHODS	5
3.	THE STUDY AREA	7
4.	PHYSICAL DESCRIPTION	9
5.	OCEANOGRAPHY	15
6.	WATER QUALITY AND POLLUTION	21
7.	PLANTS AND ANIMALS	27
	7.1-7.2 PORIFERA (Sponges)	29
	7.3-7.6 CNIDARIA, CTENOPHORA (Jelly-fish, etc. and Comb Jellies)	33
	7.7-7.8 ECTOPROCTA, BRACHIOPODA (Bryozoans and Brachiopods)	39
	7.9-7.10 MOLLUSCA (Clams, Snails, etc.)	43
	7.11-7.12 WORMS	55
	7.13-7.14 ARTHOPODA (Crabs, lobster, shrimp, etc)	63
	7.15-7.16 ECHINODERMATA (Starfish, Urchins, etc)	71
	7.17-7.18 PROTOCHORDATA (Sea squirts, etc)	79
	7.19-7.20 FISH	83
	7.21-7.22 BIRDS	87
	7.23 MAMMALS	89
	7.25-7.26 PLANTS	91
8.	ECOLOGICAL EVALUATION	103
9.	THE FISHERY	115
10.	ACKNOWLEDGEMENTS AND LITERATURE CITED	123

1.2.1a STUDY ZONES AND FIELD ZONES-New Brunswick coast of the Bay of Fundy.





1.2.1 STUDY ZONES AND FIELD ZONES-Western portion of the New Brunswick coast of the Bay of Fundy.



2.1.1 THE DELPHINUS, MRA'S SURVEY VESSEL

1. INTRODUCTION and OBJECTIVES

1.1. INTRODUCTION

Advances in technology during this century, coupled with world population increases and changes in socio-economic patterns, have had a profound impact on our traditional way of life. Heavy industry has developed to an unprecedented level and has spread from the original centres of development to new areas; including coastal sites which have historically drawn their sustenance from resource-based industries such as fishing. As a result, resource-based industries are increasingly in conflict with heavy industry since they can be, and have been, eliminated by heavy pollution. In addition, technological advances in fishing methods and resultant overharvesting have resulted in greatly reduced stocks of many fish species. At the same time, and largely as a result of these developments, man is currently looking at new ways to grow and harvest marine food species by controlled methods in the ancient, but new, science of aquaculture. Also, applied science is looking to previously unutilized food, drugs, additives and so on.

Unfortunately, while we have advanced technologically at a tremendous rate, we have, with the possible exception of traditionally valuable food species, accumulated very little useful information on our marine resources. There are many reasons for this lack of basic knowledge. Early field studies were usually academic in nature and little regard was paid to population size and sustainable yields, particularly for non-commercial species. In addition, advances in technology also influenced the biological fields and it became unfashionable to be involved in basic field biology. With the popularization of "Ecology" and the general availability of the Self-Contained Underwater Breathing Apparatus (SCUBA) this has all changed and we are now in a position to collect basic field data on most marine organisms. It is vital that we do so as rapidly as possible in order for us to make intelligent decisions regarding:

1. the location and extent of industrial development which should be allowed along our coast in relation to existing or potential resource-based industries;
2. the suitability of potentially marketable species for fisheries utilization;
3. the suitability of presently non-commercial species to potential utilization and the importance of these species to the maintenance of commercial species;
4. the monitoring of water quality with a view to preventing or stopping the introduction of harmful pollutants which may permanently damage our water systems or render our fisheries impotent;
5. the physical suitability of certain areas and species to the development of intensive fish farming and aquaculture; and
6. the maintenance of an environment which is suitable for high quality human existence.

The Research and Development Branch, New Brunswick Department of Fisheries has recognized these needs and has contracted Marine Research Associates Ltd., Lord's Cove, Deer Island, N.B. to undertake a survey of the marine resources of the New Brunswick coast of the Bay of Fundy. This is one of a series of volumes giving our findings. It is hoped that this survey will eventually include the entire coast and will cover intertidal, shallow-water, deepwater, and pelagic organisms and that the information obtained will serve as the foundation for intelligent management and utilization of the marine resources of the Bay of Fundy.

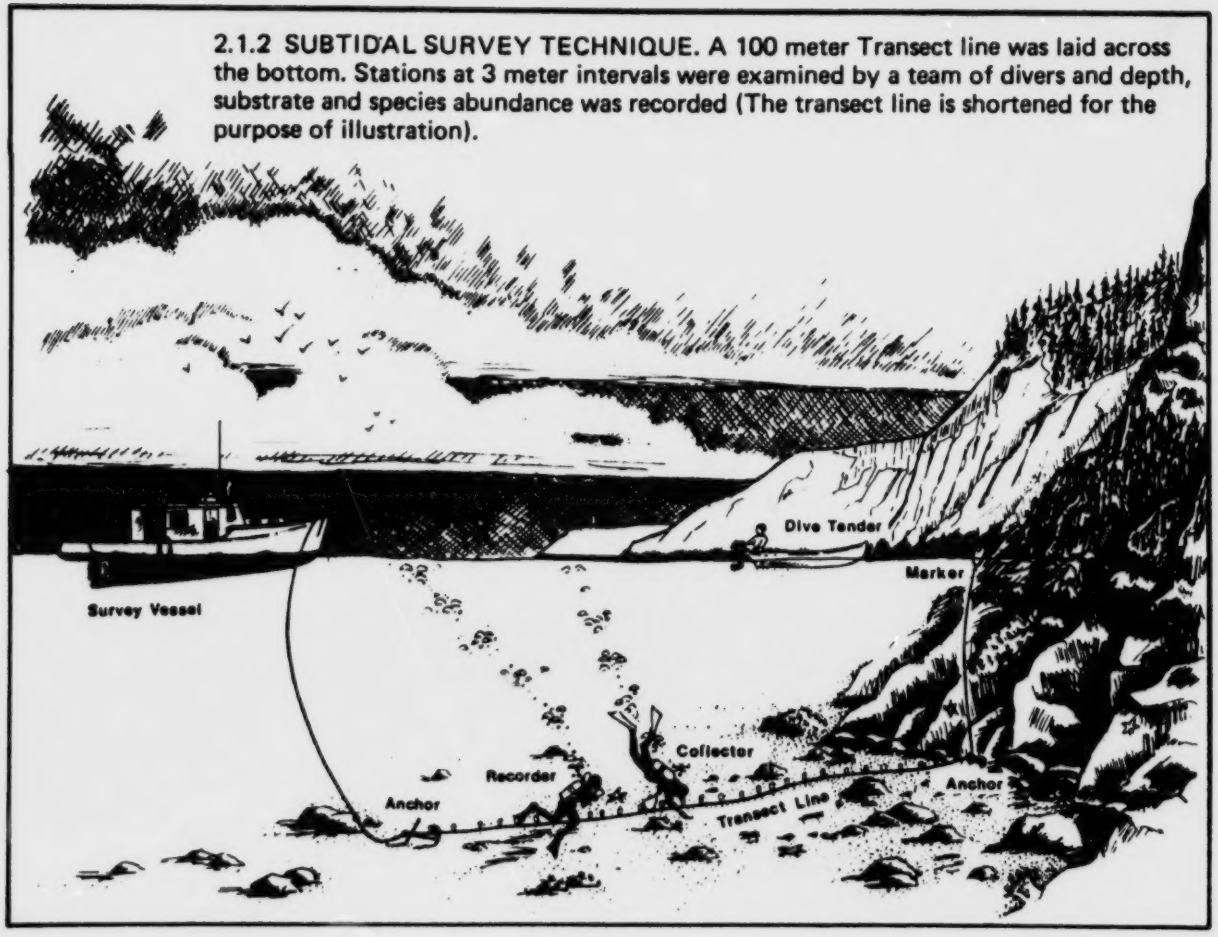
1.2. OBJECTIVES

The purpose of this study was to catalogue, as fully as possible, the shallow-water marine resources of the Bay of Fundy coast. The coast was divided into zones, each encompassing a specific geographical area of a size where field work could be completed during a reasonable period of time. Zone locations and extents are shown in Figure 1.2.1.

Specifically, the objectives of this study were:

1. to compile qualitative and quantitative data on the composition and distribution of all marine species encountered in each zone as well as meteorological, geological, oceanographic and topographic data,
2. to collect data on salinity, temperature, conductivity and pH throughout the study area,
3. to collect information on the commercial fisheries of each zone including species fished and the fishing gear, grounds, landed weight and value of each species,
4. to collect information on the abundance and exploitation rates of exploited marine resources, other than those utilized by the commercial fishery, and
5. to collect information on all sources and types of pollution, the approximate discharge rate from each source, and the distribution and impact of each pollutant.

2.1.2 SUBTIDAL SURVEY TECHNIQUE. A 100 meter Transect line was laid across the bottom. Stations at 3 meter intervals were examined by a team of divers and depth, substrate and species abundance was recorded (The transect line is shortened for the purpose of illustration).



2. METHODS

Site data have been compiled by Marine Research Associates Ltd. over a continuous field period, both winter and summer, beginning in 1964. Numerous collecting methods have been used including: shore collection and observation, dip nets, plankton tows, minnow seines, bottom drags, and diving. Some sites have been visited hundreds of times by our field staff and have been subjected to close observation. Others have been visited specifically for examination in terms of this study.

Location of sites for shore examination, spot dives or transects was considered to be critical. Since the number of study sites were limited by time and cost, it was essential that these sites be representative of the zone and provide reasonable coverage. Choice of transect sites, for detailed quantitative data, were not made until spot dives and shore examinations were completed. As a result, it was possible to choose sites for detailed examination on the basis of known information and to obtain quantitative data which was more representative of the zone than would be true with randomly selected sites.

In general, spot dives and shore examinations were made at regular intervals along the coast. In many cases, sites were examined qualitatively. However, where specific organisms were of interest, or where the site was particularly interesting, intertidal and subtidal transects were run as outlined below and water quality data have been collected as detailed elsewhere in this volume.

Data on shore sites and some dive sites were collected by teams traveling to the site by automobile. Information was collected by careful examination of the organisms occurring in the selected area and, where necessary, dip nets or minnow seines were used to sample tide pools or shallow water areas.

Until 1977, most field data were collected by teams of divers working from an outboard powered skiff or the survey vessel "Donna G". The "Delphinus" (Figure 2.1.1) was acquired in 1977 and data for the 1978-79 season were collected from this vessel.

All divers were equipped with 3/8 inch "wet" suits and accessories or constant volume dry suits (UNISUITS). The Unisuits proved to be invaluable during winter operations and allowed our divers to operate in extremely cold waters with much the same comfort as in summer. Single 72 cu. ft. air cylinders with single hose Poseidon regulators were used on all dives. Recordings of depth were taken from Aqua-Lung underwater depth gauges checked against measured depths. Underwater observations were recorded in pencil on Appleton Underwater "Ascot" paper.

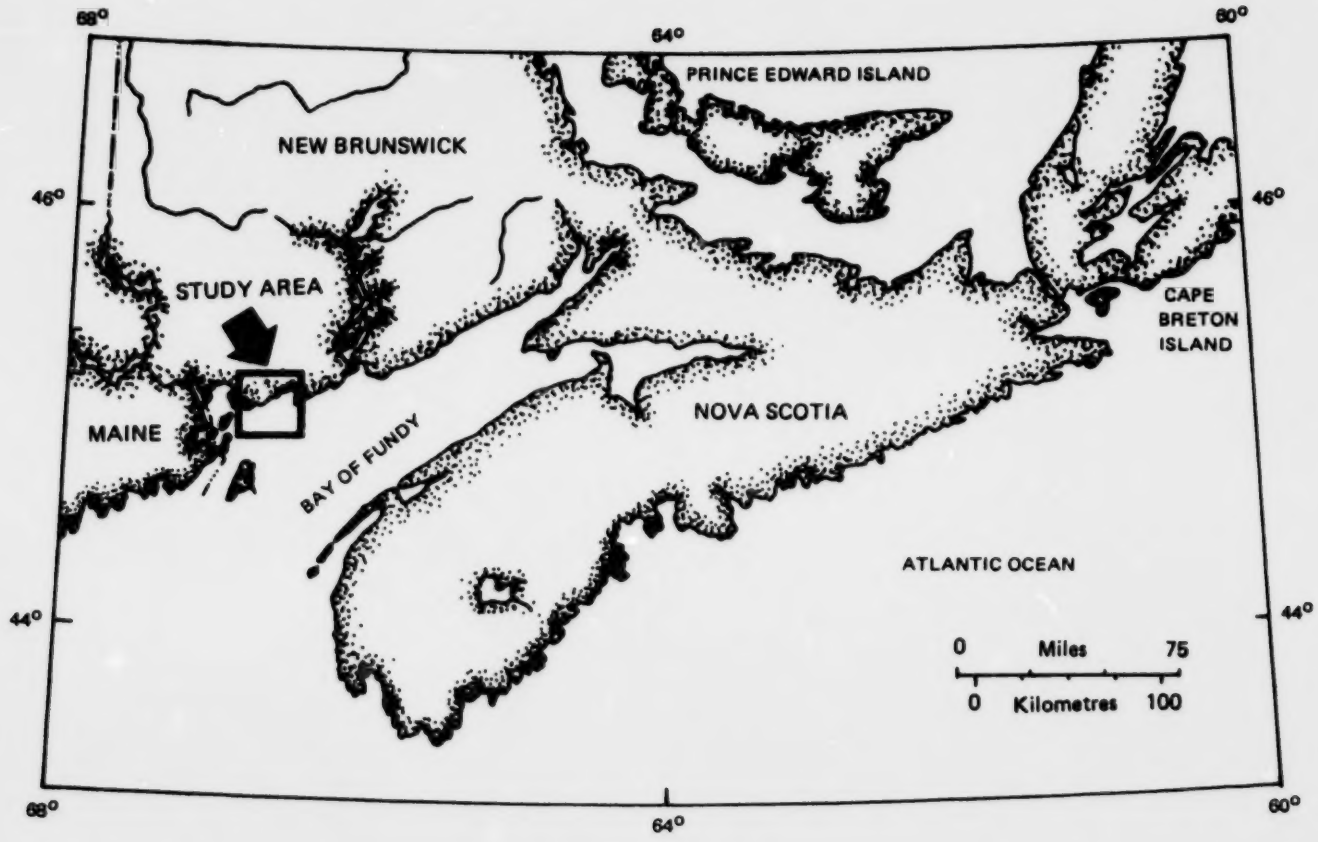
Spot dives were conducted by moving into shallow water at a predetermined site. Divers entered the water and roamed widely over the bottom at various depths recording the substrate, abundance of resident organisms, water temperature, and depth relationships encountered. Where quantitative data were required, a meter square was placed at random on the bottom and the numbers of animals within this square were counted. Upon completion of the dive, the diver was debriefed using a special Site Data Form.

"Sweep" dives were used where it was necessary to cover wide areas in shallow water. In such cases, a diver was towed on a line about 30 feet behind an outboard-powered dinghy. When areas of interest were encountered the diver released the line and examined the bottom. Data were recorded as outlined above.

Transects were run where detailed information on a site was required as shown in Figure 2.1.2. The dive team consisted of two divers, a dive-tender, and boat operator-debriefer. The divers were responsible for examination of the transect area, recording of data, and the collection of specimens. The dive-tender was responsible for deploying and picking up the diving team and insuring their safety on the surface. The boat operator-debriefer was responsible for maintaining the support vessel, recording the dive site data, and debriefing the divers at the conclusion of each dive to insure that the maximum amount of information was obtained. On steep cliffs running into deep water, one end of the transect line was anchored at the base of the cliff or, if possible, at the low water mark and laid across the bottom at right angles to the shore and anchored to the outer end. When currents permitted, the survey vessel was anchored to the other end of the transect line. When this was not possible, both ends of the transect line were marked with a buoy. In swift current, a safety line with life jackets attached was allowed to trail several hundred feet downstream from the outer buoy.

Two divers entered the water at the anchor line or outer marker buoy and proceeded to dive to the other end of the transect line. Until 1976, numbered markers at 10 foot intervals on the transect line indicated each of thirty stations on the line. From 1977 onwards a 100 meter transect line was used with stations at 3 meter intervals. At each station, the diver-recorder recorded the depth, substrate, and organisms. Where quantitative data were required a meter square was placed at the stations and counts were made within the square. Any distinct change in substrate or faunal composition which occurred between stations was also recorded. This activity was carried out along the length of the transect line to the high water mark where possible. Where this was not possible due to the steepness of a cliff, observations were made from low water. When data were required beyond the outer limit of the transect line, spot dives were made at various depths to a maximum of 100 feet. In these cases a "Shot" line was used with a stand-by diver acting as safety man.

Where visibility was at or near zero, all observations and records were made using underwater lights.



3.1.1. THE STUDY AREA

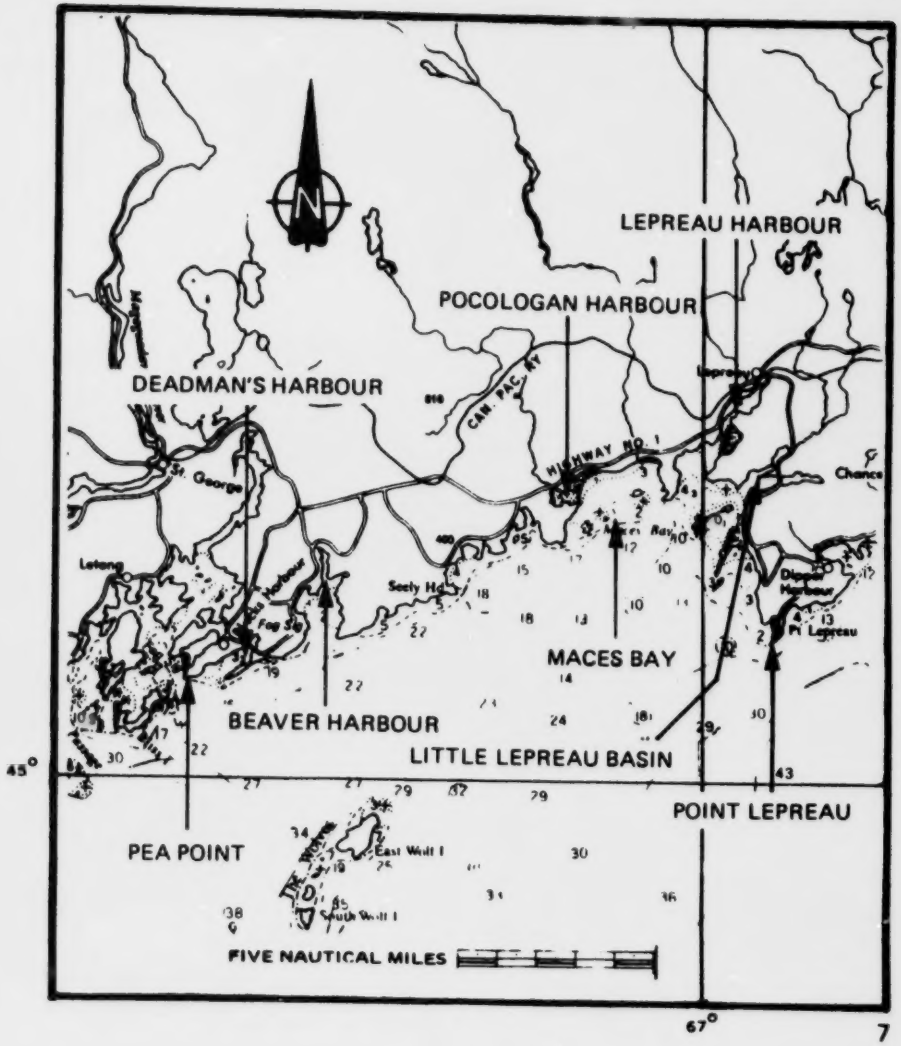
3. THE STUDY AREA

3.1 THE STUDY AREA. The study area for Zone 6, Pea Point to Point Lepreau, was considered to include all tidal waters within the confines of the 100 feet contour on the New Brunswick coast of the Bay of Fundy from Pea Point to Point Lepreau (Figure 3.1.1).

3.2 STUDY SITES. In all, 40 intertidal and subtidal spot examinations, 5 transects and 8 water quality sites were examined as shown in Figures 3.2.1 and 3.2.2. In addition, data were reviewed from MacLaren Atlantic (1975), Caddy (1970) and Applied Marine Research (1974, 1975). Original data are on file at Marine Research Associates Ltd offices, Deer Island, N.B.

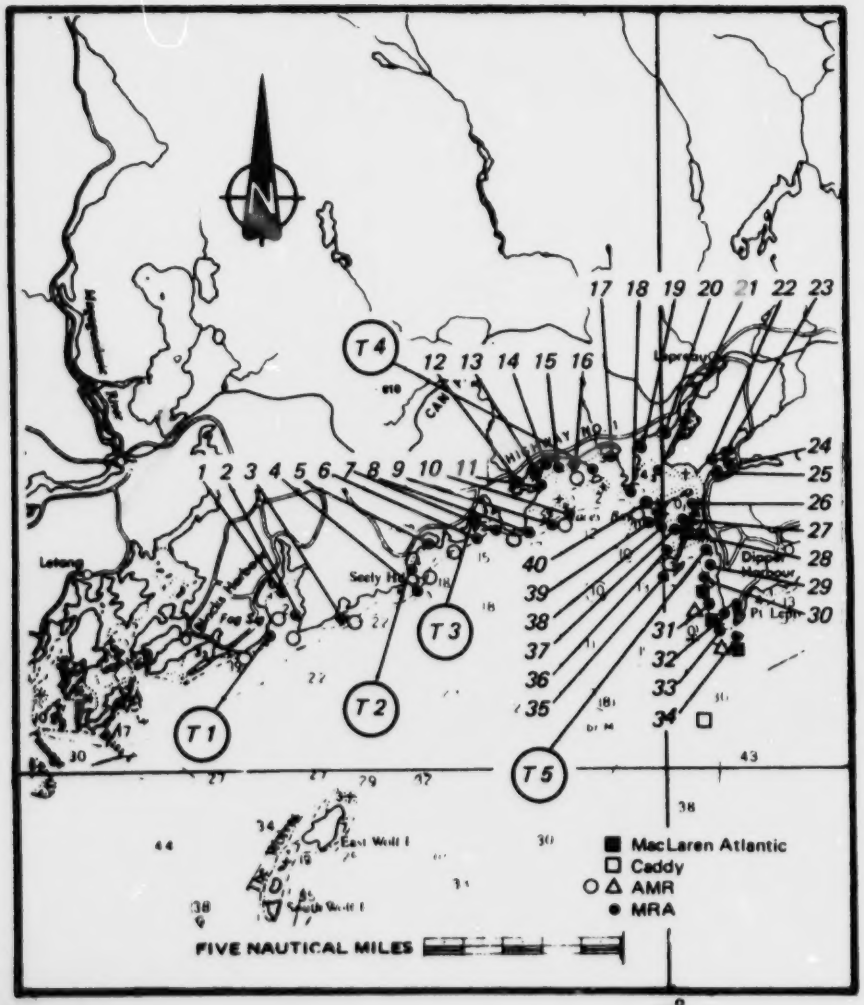
3.1.1
PRINCIPAL FEATURES

PEA POINT TO POINT LEPREAU



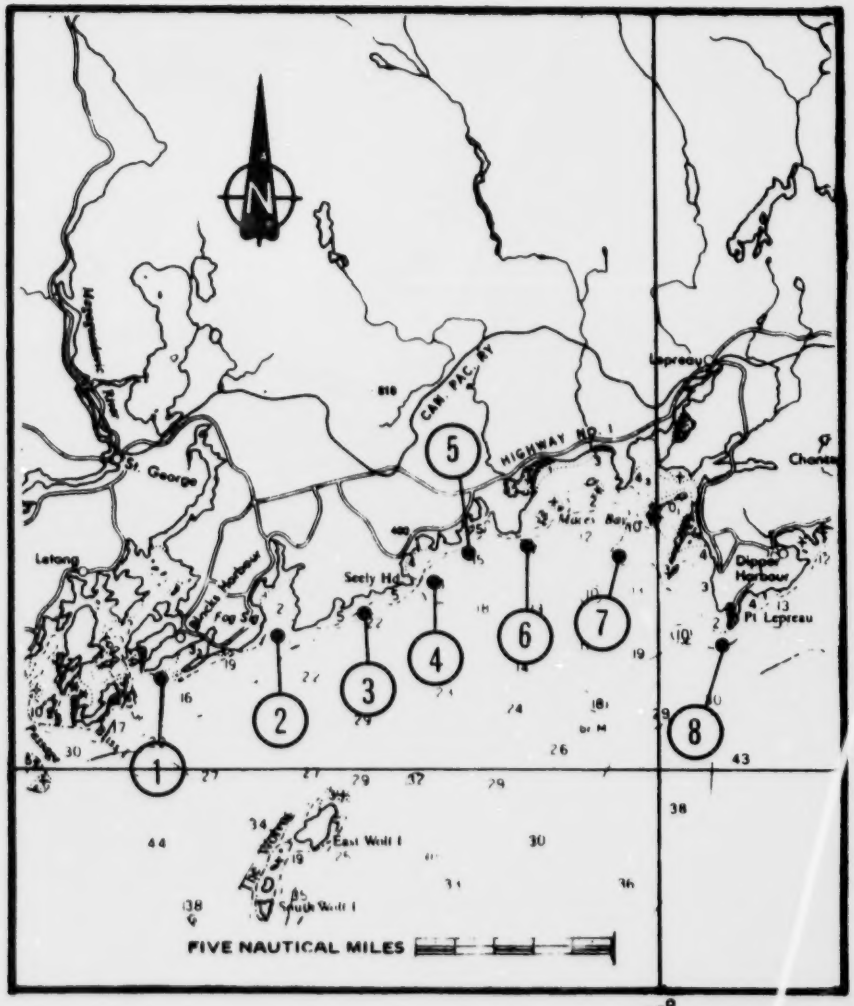
3.2.1
STUDY SITES

PEA POINT TO POINT LEPREAU



3.2.2
WATER QUALITY SITES

PEA POINT TO POINT LEPREAU



4. PHYSICAL DESCRIPTION

4.1 INTRODUCTION. This section deals with the physical aspects of the study area, particularly as they relate to the marine resources.

The study area is located on the western side of the Bay of Fundy east of the Maine-New Brunswick border but southwest of Saint John , New Brunswick. Politically, the entire area is in Charlotte County, Province of New Brunswick.

4.2 TOPOGRAPHY . Topographically, the study area is generally a rugged rocky coastline with elevations exceeding 150 feet at some locations. Access to the shore is provided by numerous inlets, coves and harbours; the major ones being Deadman's Harbour, Beaver Harbour, Pocologan Harbour, New River Harbour, Lepreau Harbour into which the Lepreau River empties and Little Lepreau Basin into which the Little Lepreau River empties. Sand beaches are in evidence at the Pocologan-New River-Maces Bay area. Concerning Point Lepreau itself: "The peninsula consists of a low, rolling plateau with rock cliffs which drop sharply to the sea. The red rock of these cliffs and the many cobble beaches at their base compose the dominant scenic feature of the seashore", (MacLaren Atlantic, 1977).

Islands are largely restricted to Maces Bay and include Penn Island at Crow Cove and Pocologan Island, Mole Island and The Brothers at Maces Bay.

4.3 GEOLOGY. The area has been identified as a rugged, rocky coastline. "The region has been heavily glaciated. Along the coast the rocks are polished, striated, and grooved, and numerous roches moutonnees with well-marked stress and lee slopes show the direction of glacial movement". (Alcock, 1944).

Figure 4.3.1 summarizes the bedrock geology of the area. As can be seen, there are 4 major formations:

1) The Perry Formation, consisting of red conglomerate and sandstone, dominates the area around Black's Harbour and Deadman's Harbour.

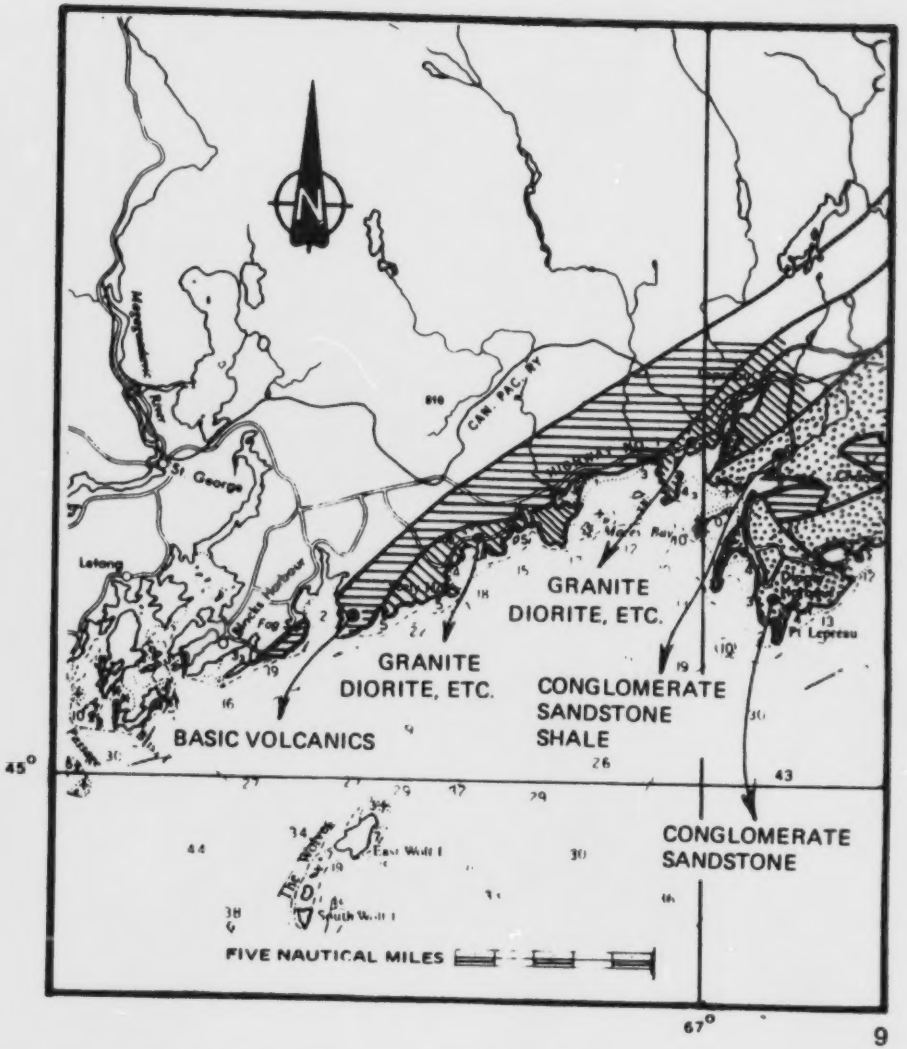
2) The Coldbrook Group, comprised chiefly of acidic and basic volcanic rocks, covers that area from both sides of the mouth of Beaver Harbour to the New River area.

3) The Lancaster Formation dominates the Little Lepreau Basin area. It consists mainly of grey to greenish-grey sandstones.

4) The Lepreau Formation dominates the area from the western mouth of the Little Lepreau Basin to the eastern side of Dipper Harbour and also includes certain areas on both sides of Lepreau Harbour. This formation "consists of coarse conglomerate and sandstone containing large, well-rounded boulders" (Alcock, 1944).

4.3.1
COASTAL GEOLOGY

PEA POINT TO POINT LEPREAU



There are two other note-worthy formations. "A complex of volcanic, sedimentary and intrusive rocks most of which at least are of Silurian age" (Alcock, 1944) occurs at Beaver Harbour while a granite belt runs along the coast from Negro Head to Pocologan Harbour and also occurs at Lepreau Harbour.

Surficially, the area is largely dominated by heavy tills and glacial gravels.

4.4 CLIMATE AND METEOROLOGY

The study area, being in the north temperate region, is characterized by warm summers and cold winters. The Bay of Fundy strongly influences the climate resulting in somewhat cooler summer temperatures and warmer winters with more rain than inland. Fog frequently occurs along this coastline but occurs less often in the upper reaches of Lepreau Harbour and Little Lepreau Basin where there is a greater continental influence.

a) TEMPERATURES. Temperatures for the study area were not available on a long-term basis. However, they would be somewhat comparable to Saint John, N.B. Data presented in Table 4.4.1 for Saint John City can be considered representative for the study area. However, MacLaren Atlantic (1975) has pointed out: "The mean annual temperature based on a ten-year record for Pennfield Ridge, within ten miles of Point Lepreau, is 41.9 degrees F. The temperatures measured over a 29-year period at Saint John...are quite similar, the only differences being that in summer the monthly mean temperatures at Point Lepreau are slightly higher (3 degrees F.) and in winter slightly lower (3 degrees F) than in Saint John". Temperature data for Nov. 74-Oct. 75 for Point Lepreau are presented in Table 4.4.2.

b) PRECIPITATION. Average monthly values for rainfall and snowfall from 25-29 years data are given in Table 4.4.1. Data for Saint John city can be considered as representative for the study area since long-term data for the latter were not available. At Point Lepreau, however, rainfall measurements for an 80-year period indicate that rainfall occurs throughout the year and averages 33.61 inches per year, a lesser amount than the measured amount of 42.88 inches in Saint John ... Snowfall at Point Lepreau averages 65.65 inches annually and occurs from October to May. As with rainfall, there is less snow at Point Lepreau than at Saint John, which averages 85.4 inches annually". (MacLaren Atlantic, 1975).

c) FOG. Coastal fog occurs in the Saint John and Pennfield Ridge areas close to 100 days annually while inland areas received much less fog (Dept. of Environment, 1973). Table 4.4.3 summarizes the occurrence of fog for a 10-year period at Pennfield Ridge (located approximately 36 miles southwest of Saint John) and for a 30-year period at Saint John city, Saint John airport and Fredericton airport. The term 'fog' here denotes the point at which visibility is reduced to 5/8 mile or less. These data can be considered as representative for the study area.

d) WIND. Westerly winds prevail in the study area throughout most of the year being more northwesterly in winter and southwesterly in summer. "Average wind speeds from the west and from the south equals or exceed 15 miles per hour ... Briefly the average monthly wind speed throughout the year is greater at Point Lepreau than at the nearby inland locations of Pennfield Ridge and Saint John. During the winter the strong outflow of cold arctic air produces storms south of the Bay of Fundy with resulting strong winds in the Point Lepreau Area where, as in summer, winds are moderate except for tropical storms.

The most severe weather phenomena which occur at Point Lepreau are intense storms and tropical cyclones (Hurricanes)... it was estimated that winds in excess of 100 miles per hour occur with a frequency of once in twenty years". (MacLaren Atlantic, 1975).

Data for wind direction and speed over a 12-year period at Point Lepreau are found in Figure 4.4.1 and are considered as representative for the study area

e) SUNSHINE. Conditions of sunshine and overcast conditions occurring at Saint John City are summarized in Table 4.4.5 for a 10-29 year period. These data can be considered as representative for the study area.

4.5 FRESHWATER RESOURCES.

With the exception of New River, Lepreau River and Little Lepreau River, freshwater drainage into the study area is restricted to numerous small streams and brooks as well as surface drainage. Some of these streams and brooks do influence the fauna of the immediate coastline, particularly in bays and inlets. Studies carried out by Hachey and Bailey (1972) suggest that the Saint John River effluent is diverted southward rather than to the southwest and thus has minimal effect on the study area (See Fig. 4.5.1).

Streamflow data was only available for Lepreau River (Historical Streamflow Summary Atlantic Provinces to 1976). This river has a drainage area of 92.1 square miles with a mean annual discharge of 259 Cu. ft/sec. (1919-1976).

TABLE 4.4.1 CLIMATOLOGICAL DATA FROM SAINT JOHN, NEW BRUNSWICK (averaged from 25-29 years data). Temperatures are in degrees Farenheit. Rainfall and snowfall are in inches. (Data from The New Brunswick Electric Power Commission "Preliminary Environmental Impact Statement - Lepreau Nuclear Generating Station" by MacLaren Atlantic, 1975).

	DAILY TEMPERATURE			RAINFALL	SNOWFALL
MONTH	MAX.	MIN.	MEAN	MEAN	MEAN
January	28.2	12.2	20.3	2.58	23.7
February	30.1	13.4	21.7	2.39	21.0
March	37.3	22.3	29.8	2.33	15.4
April	47.0	32.3	39.7	3.46	4.9
May	57.0	41.1	49.1	4.04	0.2
June	64.3	48.6	56.5	3.69	0.0
July	70.1	54.0	62.0	3.53	0.0
August	70.0	54.5	62.3	3.93	0.0
September	64.3	49.5	56.9	3.93	0.0
October	55.3	41.4	48.3	4.07	0.5
November	44.8	32.3	38.6	5.33	3.8
December	33.2	18.9	26.1	3.60	15.9
Year	50.1	35.0	42.6	42.88	85.4

TABLE 4.4.2 CLIMATOLOGICAL DATA FROM POINT LEPREAU, N.B. (From November 1974 to October 1975). Temperatures are in degrees Centigrade. Precipitation is in millimeters. (Data from the New Brunswick Electric Power Commission "Environmental Assessment for the Point Lepreau Generating Station" by MacLaren Atlantic, 1977).

MEAN DAILY TEMPERATURE

MONTH	MAX.	MIN.
January	3.3	-17.2
April	6.1	- 2.2
July	17.2	10.0
October	11.7	7.7

MEAN ANNUAL TEMPERATURE ^{O}C 4.4
DAILY RANGE OF TEMPERATURE ^{O}C

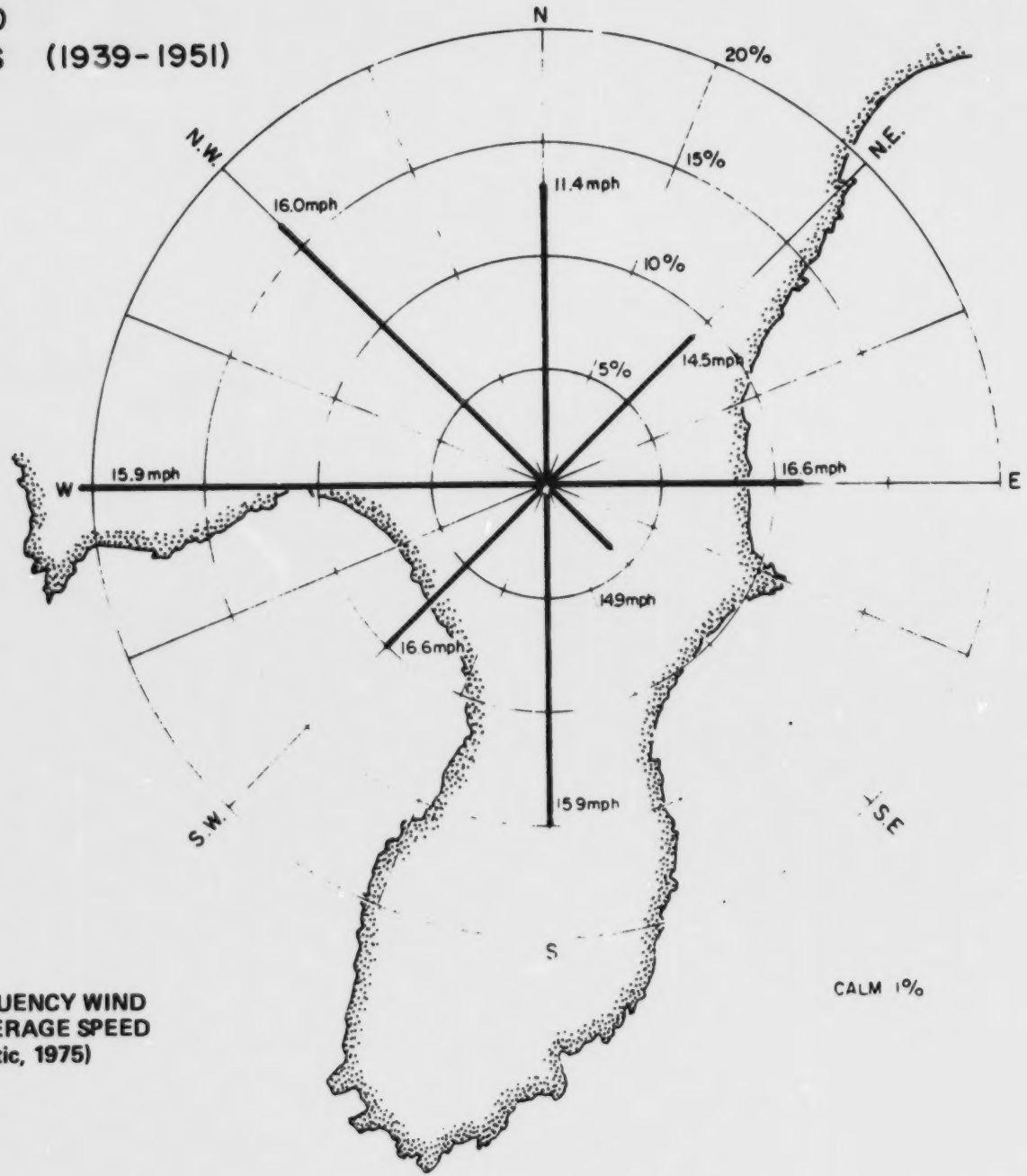
January 20.5
July 7.2

EXTREME LOW TEMPERATURE ^{O}C -23.9
EXTREME HIGH TEMPERATURE^{O}C 25.6
MEAN ANNUAL PRECIPITATION (mm) 525

TABLE 4.4.3 Monthly mean number of days with an incidence of Fog. (Data from "An Appraisal of the Environmental Consequences of Developments Proposed for Lorneville, N.B., Vol 2, Task Reports).

MONTH	PENNFIELD RIDGE	SAINT JOHN CITY	SAINT JOHN AIRPORT	F'TON AIRPORT
January	3.1	3.1	3.2	2.5
Feb.	3.3	3.2	2.8	2.0
March	6.4	5.3	4.5	2.4
April	6.7	5.9	6.4	4.3
May	12.0	11.4	9.5	2.8
June	13.7	11.7	12.0	3.4
July	17.7	17.2	17.1	4.0
August	15.0	12.6	14.2	3.6
Sept.	15.0	12.6	14.2	3.6
Oct.	8.6	7.6	8.8	4.2
Nov.	5.6	5.0	5.5	5.3
December	3.9	3.4	2.6	2.8
Year	107.5	98.0	99.2	41.1

WIND DIRECTION FREQUENCY AND AVERAGE SPEEDS (1939-1951)

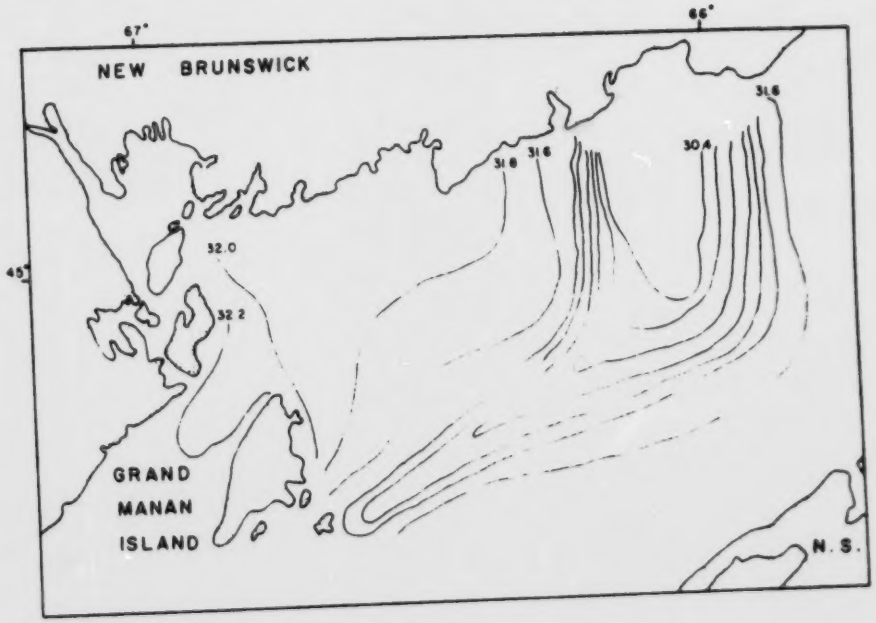


4.4.1 PERCENT FREQUENCY WIND DIRECTION AND AVERAGE SPEED (from: MacLaren Atlantic, 1975)

TABLE 4.4.5 Monthly mean sunshine and cloud data for Saint John City, N.B. based on 10-29 years data. (Data from The New Brunswick Electric Power Commission Environmental Assessment for the Point Lepreau Generating Station, 1977).

MONTH	MEAN-BRIGHT SUNSHINE HOURS	MEAN AMOUNT OF CLOUD (Tenths)
January	110	5.9
February	125	5.7
March	153	6.1
April	159	6.3
May	193	6.2
June	201	6.7
July	219	6.7
August	209	6.2
Sept.	175	5.8
Oct.	153	6.2
Nov.	90	6.8
Dec.	108	6.2
Year	1,895	

4.5.1 SURFACE SALINITY DURING SPRING FRESHET (1930) (From: Hachey and Bailey, 1952).



5. OCEANOGRAPHY

5.1 INTRODUCTION. Since most of the study area is openly exposed, the distribution and abundance of intertidal and shallow water is greatly influenced by wind and waves in combination with other oceanographic parameters discussed in this section.

5.2 BATHYMETRY. As can be seen in Figure 5.2.1 depths reach 100 feet and more along the coast considered in this report. As a result, pelagic fish, birds and mammals occur commonly in the area.

5.3 SUBSTRATES. Figures 5.3.1 to 5.3.3 show the locations of various substrates recorded during this study. The area is dominated by rocky shores usually dropping subtidally to cobble, boulders and ledge. Sandy bottom occurs at some locations and becomes more frequent at the Pocologan - Lepreau Harbour-Maces Bay area. Muddy bottom dominates the inner harbour at Pocologan as well as the Little Lepreau Basin area.

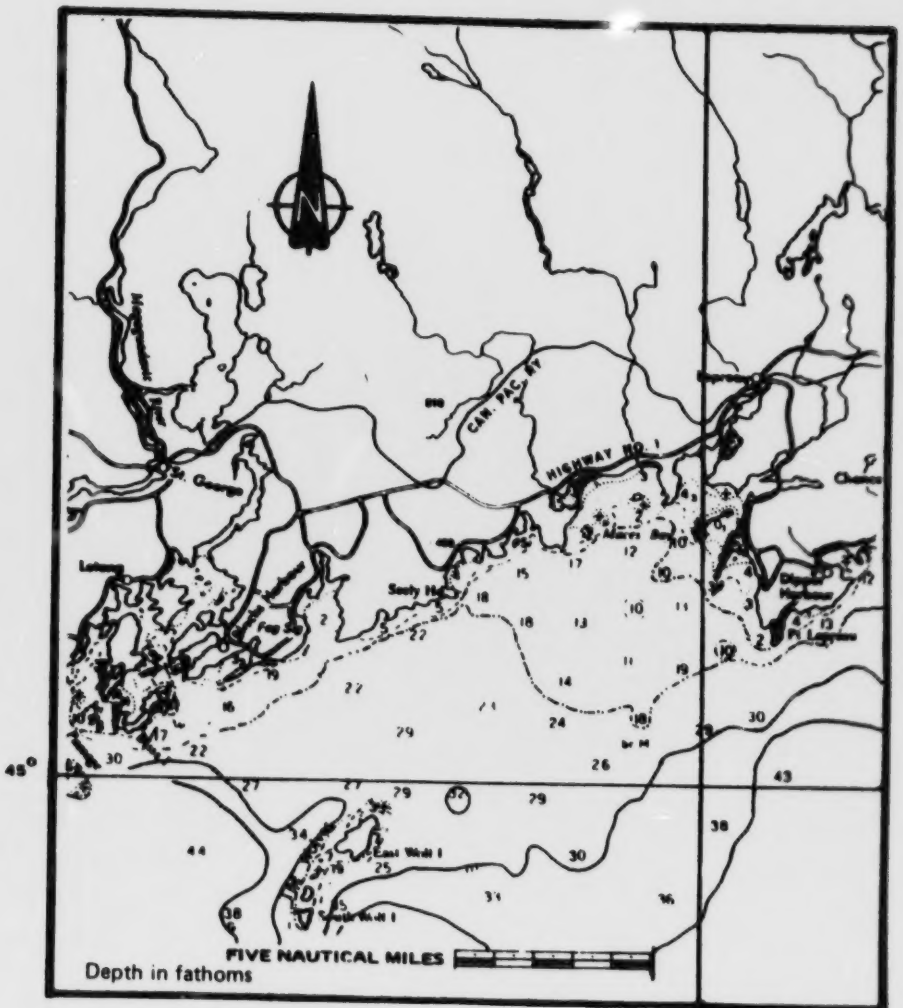
5.4 TIDES. The world renowned Bay of Fundy tides influence the study area. The mean tidal range at Dipper Harbour is 20.2 ft. with a range of 28.1 ft. for large tides". (MacLaren Atlantic, 1975). This information can be considered as representative for the study area; Dipper Harbour being only a short distance from Point Lepreau itself. The intertidal area is extensive at Maces Bay and in most embayments,with the Point Lepreau ledges representing one of the largest and most interesting intertidal rocky shores on this coast.

5.5 CURRENTS. Usually in a tidal bay the currents flow in and out with the flood and ebb tides. However, the currents near Point Lepreau apparently flow in an opposite direction to the tides. The explanation for this is described by MacLaren Atlantic (1977): "During flood tide, the general inflow of water into Fundy flows from west to east past Point Lereau... During flood tide the currents on the west side of Point Lepreau, off Indian Cove, flow very strongly toward the southeast but turn north for about 2 hours at high tide. Indian Cove currents have not been well defined but both current meter and drogue studies indicated some eddy movements. About half way between low and high tide the currents on the east side of Point Lepreau turn to flow southwesterly reaching their highest speeds just after high tide and continuing to flow southwesterly until about half way between high and the next low tide. These southwesterly currents are an eddy which is induced by the easterly flowing flood tide and persists until the following ebb tide is strong enough to reverse it.

"During ebb tide the main outflow of water from Fundy is approximately toward the west-southwest past Point Lepreau. On the west side of Point Lepreau, off Indian Cove, the currents flow southeasterly as part of an eddy induced by the ebb tide. This southerly flow continues

5.2.1
BATHYMETRY

PEA POINT TO POINT LEPREAU



throughout ebb and flood tide until the following high tide. On the east side of Point Lepreau the southwesterly currents and eddy induced by the previous flood tide continue until about half way through the ebb tide. When the ebb tide gains sufficient momentum it reverses the eddy and the currents begin to flow north or east depending on the particular location on the east side of the Point. These currents then flow in a general northeasterly direction for the remainder of the ebb tide and until about half way through the following flood tide. The duration of a current direction, the magnitude of speeds and the time of direction change with respect to the tidal cycle all vary from station to station". Figures 5.5.1 and 5.5.2 show the current patterns at Point Lepreau for flood tide and ebb tide respectively.

5.6 LIGHT AND WATER CLARITY. Water clarity is generally low. Our divers recorded average visibility of 20 to 25 feet with a maximum of 30 feet. Visibility is considerably reduced during southerly winds and improves when the wind is off the land.

5.7 TEMPERATURE. Water temperature data for a station located approximately 15 miles southwest of Point Lepreau was presented by Bailey, MacGregor and Hachey (1954). Figure 5.7.1 illustrates their findings. In this particular case surface layer refers to the upper 25 meters.

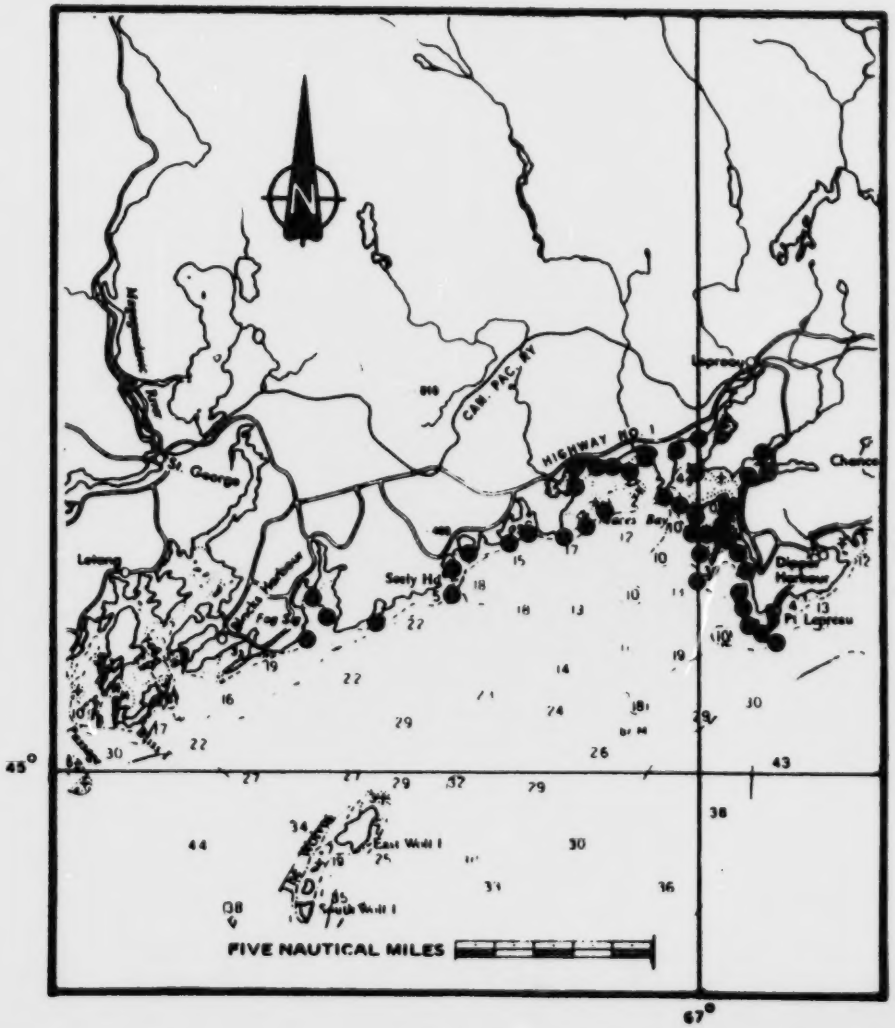
Winter icing is minimal and restricted to drainage areas.

5.8 SALINITY. Bailey, MacGregor and Hachey (1954) also recorded annual salinity data for the same 2- year period at the station southwest of Point Lepreau. The results are illustrated in Figure 5.7.1.

5.9 WAVES AND EROSION. Since most of the study area is relatively unprotected it often receives the full force of storms. Southerly winds create waves of considerable force which can be extreme at certain localities. As a result the erosive effect of wave action is in evidence at all exposed areas, thus creating an almost smooth sloping bedrock in many places. Generally the pattern of erosion is typical for the area.

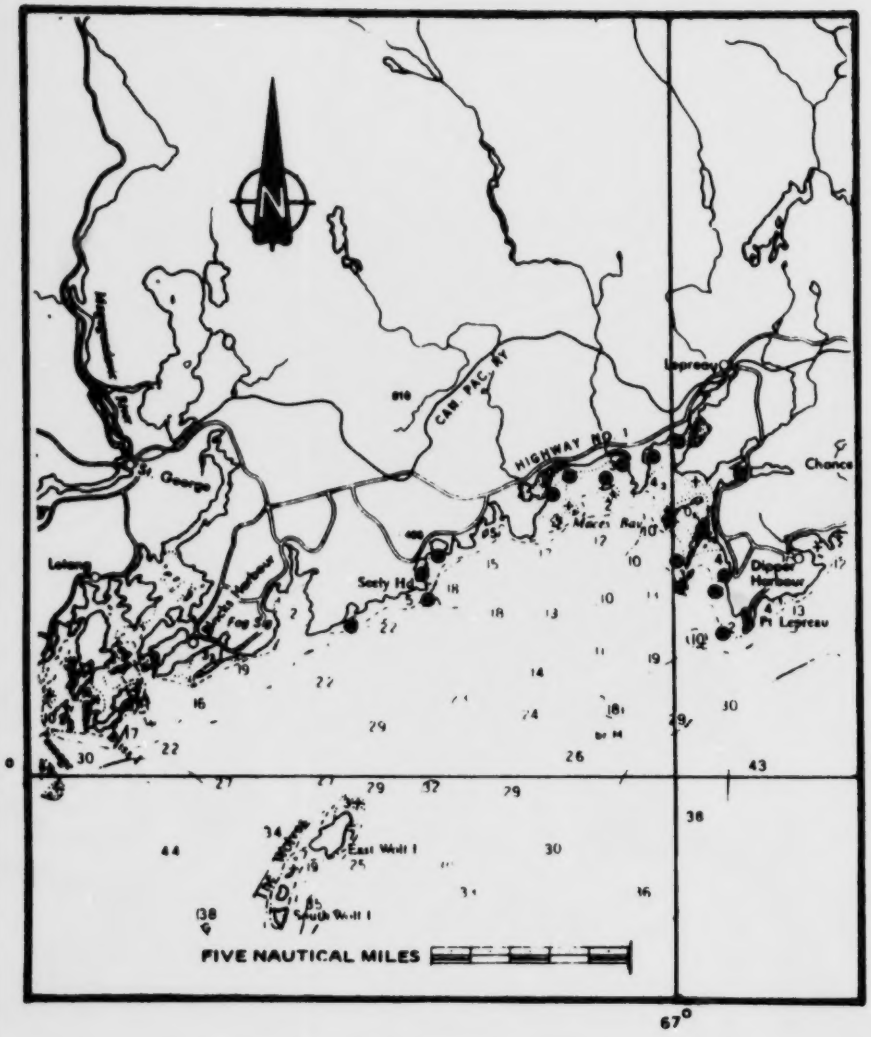
5.3.1
OCCURRENCE OF
ROCKY SUBSTRATE

PEA POINT TO POINT LEPREAU



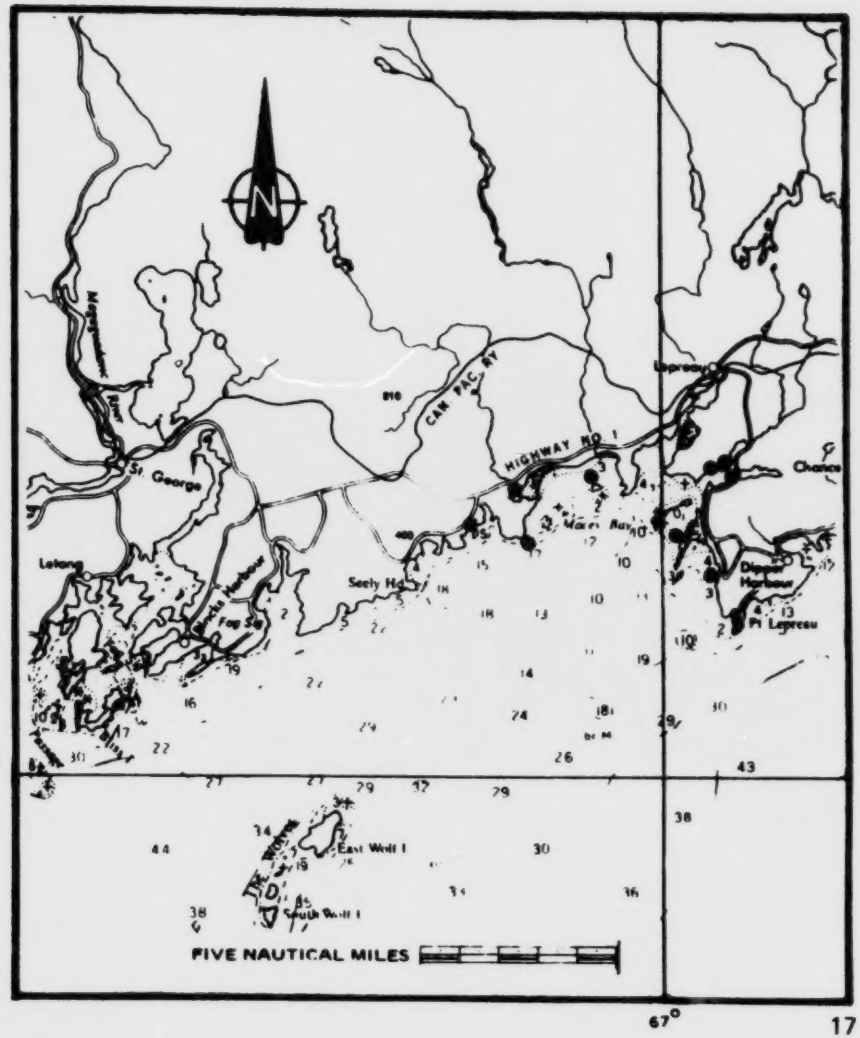
5.3.2
OCCURRENCE OF SAND

PEA POINT TO POINT LEPREAU

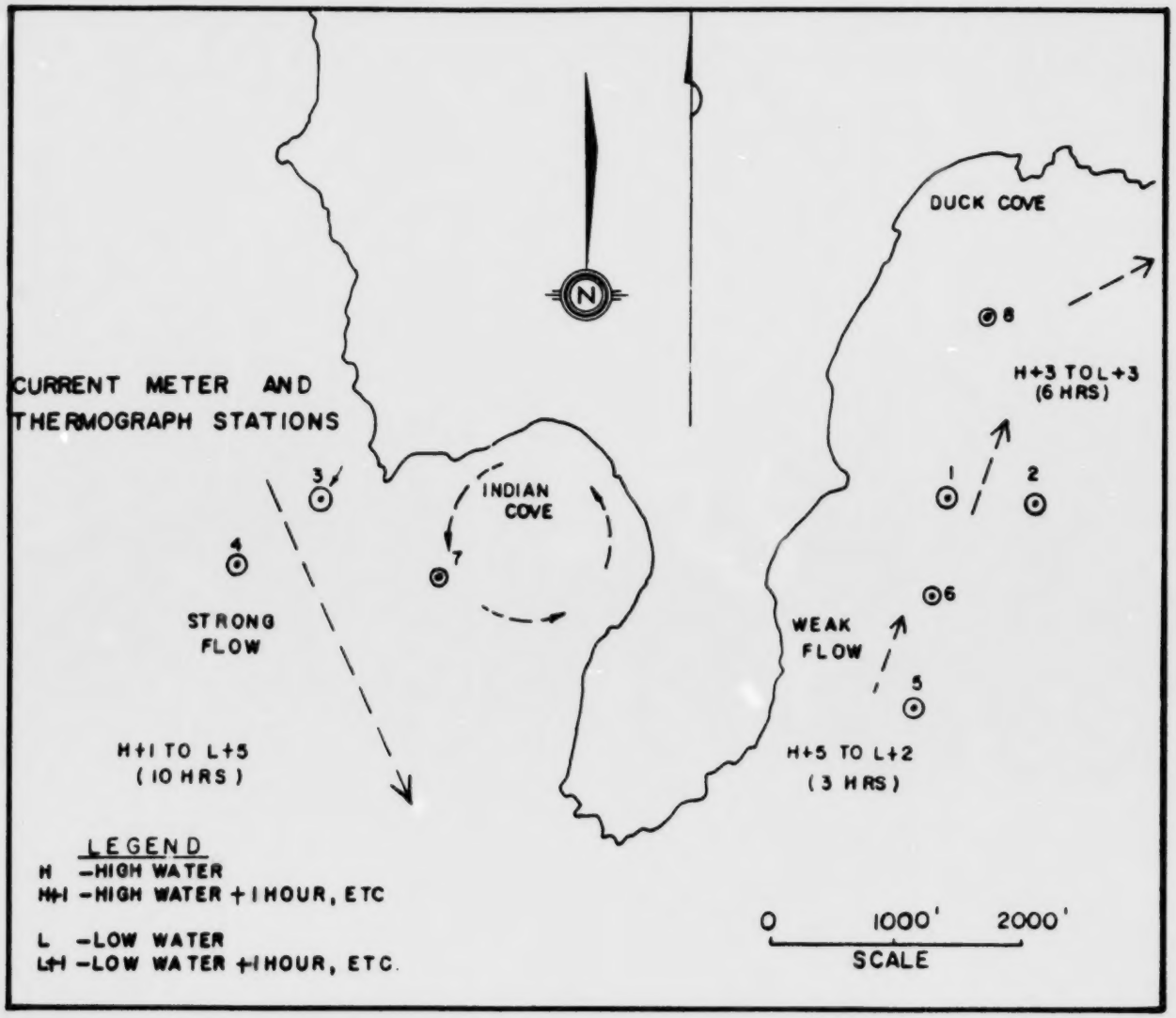


5.3.3
OCCURRENCE OF MUD

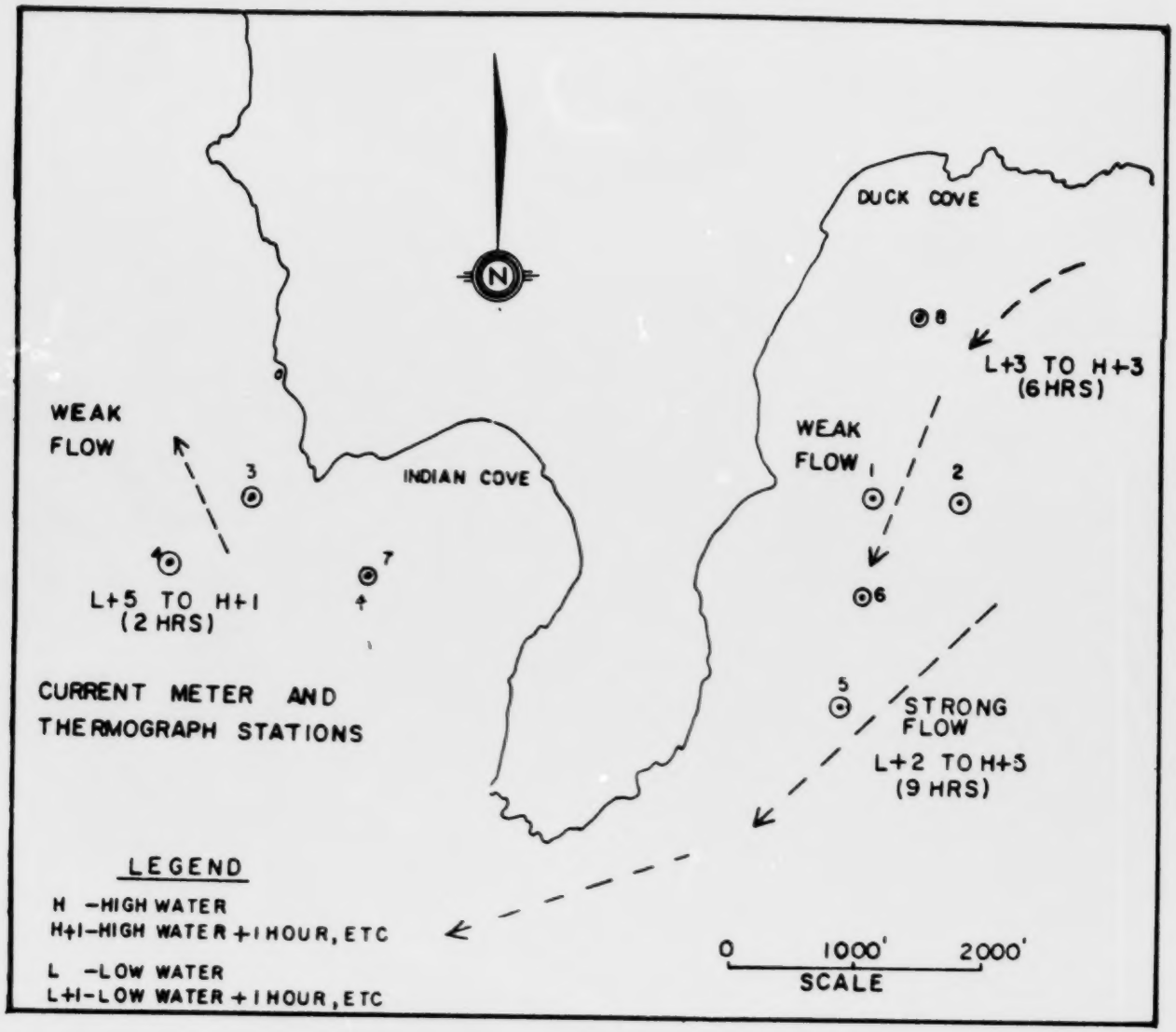
PEA POINT TO POINT LEPREAU



5.5.1 CURRENT SUMMARY-FLOODTIDE (From: MacLaren Atlantic, 1976)



5.5.2 CURRENT SUMMARY - EBB TIDE (From MacLaren Atlantic, 1976)



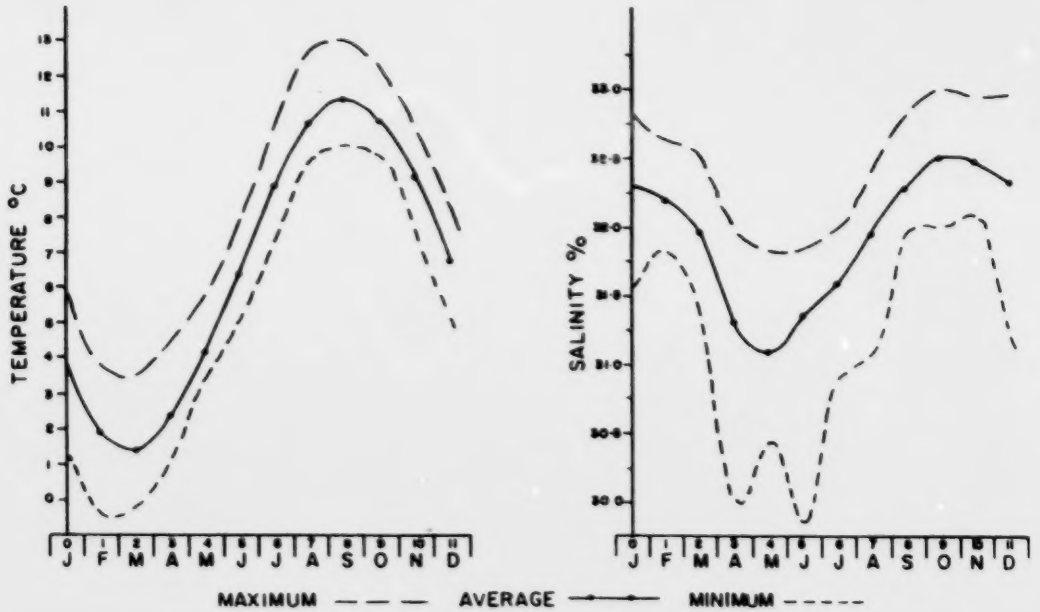


Figure 5.7.1 Normal mean monthly temperature (°F) and salinity (‰) for the surface layer (ie, the upper 25 meters) for a station 15 miles southwest of Point Lepreau for a 20 year period (After Bailey, MacGregor and Hachey, 1954).

6. WATER QUALITY AND POLLUTION

6.1 INTRODUCTION. The study area is relatively free from pollution and water quality can be considered as good. In fact there are certain areas where the coastline is clear and relatively uninhabited.

Identified sources of pollution include shore-side residental waste (most notably at Deadman's Harbour, partly from the Black's Harbour residental and commercial area) as well as two fish processing plants located at Beaver Harbour. Two other sources of pollution that could, without close long-term attention, be a potential hazard include a tourist trailer park located at Pocologan (Baxter, 1973) as well as the highly popular Provincial Park and beach at New River (Donnelly, 1973). See Figure 6.1.1 for pollution sources.

The study area has been subjected to moderate oil spills originating from Saint John, N.B. and future developments at Saint John still pose a threat as does the Point Lepreau Nuclear Generating Station and the Lorneville deepwater port facility.

6.2. POINT LEPREAU WATER QUALITY ANALYSIS. A water sampling program was undertaken by MacLaren Atlantic Ltd. for a 12 month period during 1974 and 1975 at Point Lepreau. The results are summarized in Table 6.2.1.

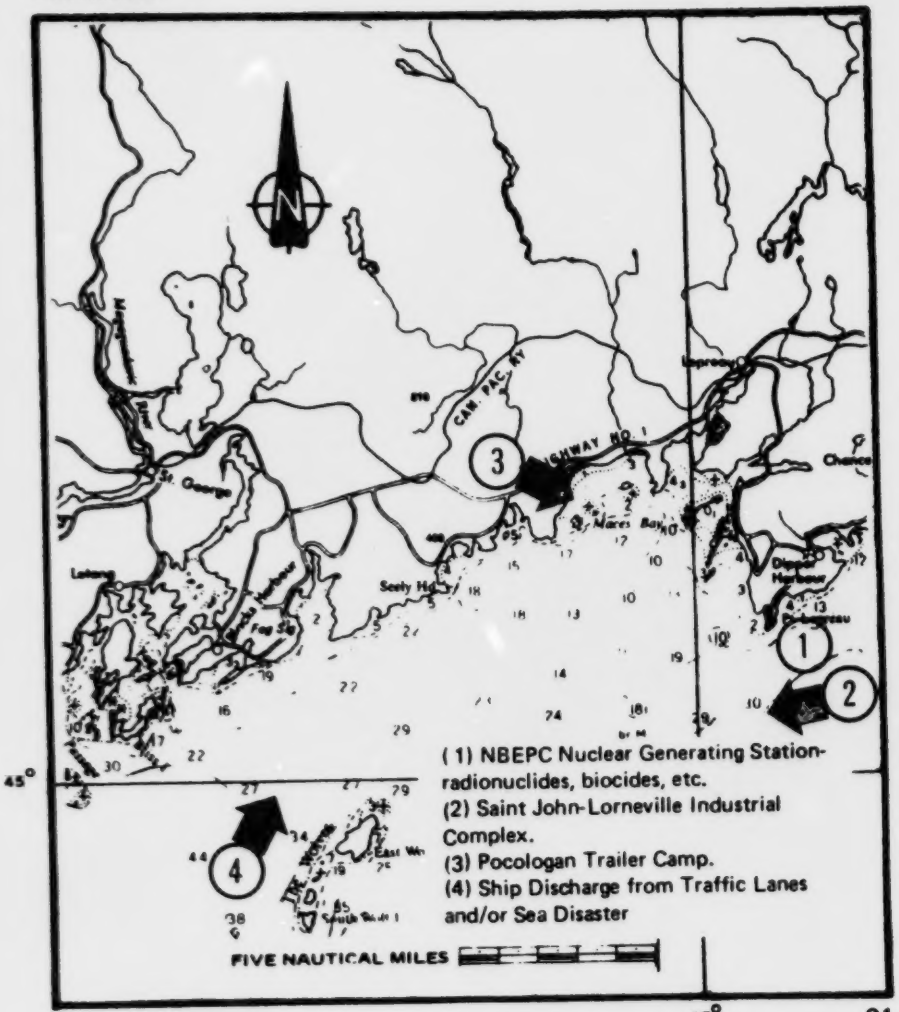
The waters in the Point Lepeau region are characterized by low amounts of suspended matter (averaging 2 mg/1). As indicated by Total Organic Carbon and Biochemical Oxygen Demand measurements, the water is relatively free of organic matter.

Generally, the concentrations of heavy metal ions in the Point Lepreau region are significantly higher than in the surface and deep waters of the Western North Atlantic. The data indicate the probable influence of fresh water river discharge and non-point surface runoff on marine water chemistry. In particular, the concentrations of copper, lead, iron, mercury, and zinc levels exceed the mean concentrations of the North Atlantic Region.

In open sea water copper concentrations range between 1.0 µg/l to 25 µg/l. The reported concentration of copper in surface waters off Nova Scotia is 0.6 µg/l, which corresponds to the lower limit of the range. This compares with the average copper concentration of 8 µg/l for the Point Lepreau region. However, the mean copper concentration does not exceed the concentration for the marine environment. The safe level is defined as the concentration below which ecological damage is expected to be minimal. Lead in open sea water is in the order of 0.03 µg/l. The safe level in the marine environment is 10 µg/l. The concentration of lead in the Point Lepreau region is 5 µg/l. Although the concentration of lead exceeds the mean concentration of open sea water, the existing level of 5 µg/l does not constitute a hazard. The average concentration of iron

6.1.1
POTENTIAL POLLUTION SOURCES

PEA POINT TO POINT LEPREAU



in the waters off Point Lepreau is 80 µg/l. This compares with concentration of 6 µg/l in the Western North Atlantic off Nova Scotia and 0.1 to 1.5 µg/l in the St. Margaret's Bay region. However, the iron level is well below the hazard level of 300 µg/l.

The mercury levels of 0.2 µg/l are considerably higher than values observed in unpolluted sea water and surpass the concentrations considered safe to marine life. The source of mercury contamination is unknown. In light of the high observed mercury levels a more exacting sampling and analysis program for mercury is warranted.

The average zinc level of 70 µg/l in the waters off Point Lepreau compare with 1 µg/l in the Western North Atlantic. However, the zinc levels are generally below the hazardous concentration of 100 µg/l.

The nutrient levels are fairly low when compared with other salt water estuarine environments. The seasonal periodicity of the nitrate/nitrite and phosphate concentrations was assessed by Fourier time series analysis of the available data for sampling station 3-1 and station 5-1. Sampling station 3-1 was located near the proposed cooling water intake, while station 5-1 was in the vicinity of the proposed cooling water outfall. According to the analysis, both the nitrate/nitrite and the phosphate concentrations at both stations exhibit significant yearly periodicities. The predicted maxima in nitrate/nitrite levels (0.60 mg/l N) occur in April-May, while the phosphate reaches peak concentrations (0.07 mg/l) in October-November. Periodicities shorter than one year were found to be insignificant by analysis of variance testing. Generally, the nitrate/nitrite N to phosphate P ratio was in the order of 10:1 by weight, indicating good nutrient balance.

Temperature, salinity, and pH were collected at stations shown in Figure 3.2.2. Results are given in Table 6.2.2.

TABLE 6.2.2 TEMPERATURE (^{o}C), SALINITY (^{o}/100) AND pH (at 14^{o}C) RECORDS FROM THE STUDY AREA (July 31, 1978 - temperature and salinity; July 27, 1978 - pH)

STATION		7	6	5	4	3	2	1
SURFACE	^{o}C	13.6	13.3	13.3	12.7	12.1	13.4	12.4
	^{o}/100	28.1	29.2	29.9	29.5	29.9	29.9	29.9
	pH	7.48	7.52	7.52	-	7.69	-	7.59
1.5M	^{o}C	12.7	11.5	11.5	11.9	11.3	11.0	11.7
	^{o}/100	28.5	29.5	29.7	29.7	29.8	29.8	29.7
3.0M	^{o}/100	12.7	11.1	11.3	11.7	11.0	10.8	11.7
	^{o}/100	28.4	29.6	30.1	29.8	29.8	29.8	29.9
6.0M	^{o}C	12.5	11.1	11.2	11.3	10.9	10.6	10.6
	^{o}/100	28.9	29,7	30.1	29.8	29.8	29.9	30.0
9.0M	^{o}C	12.2	11.0	10.6	11.1	11.0	10.5	10.4
	^{o}/100	29.9	29.8	30.0	29.9	29.9	30.0	30.0
12.0M	^{o}C	10.8	10.8	10.3	11.0	10.9	10.5	9.8
	^{o}/00	29.7	29.7	30.0	29.9	29.9	30.0	30.1

TABLE 6.2.1 WATER QUALITY DATA - POINT LEPREAU (MacLaren Atlantic, 1976)

STATION	SAMPLE DEPTH m	TOTAL PHOSPHORUS mg/l - P			PHENOL ug/l			NITRATE + NITRITE mg/l - N			CADMIUM mg/l	CHROMIUM mg/l	AMMONIA mg/l - NH_3	B.O.D. mg/l	COPPER mg/l			IRON mg/l			LEAD mg/l			MERCURY mg/l			ZINC mg/l		
		A	B	C	A	B	C	A	B	C	A	A	A	A	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
2 - 1	1	0·05	0·19	<0·01	1·68	4·4	<0·2	0·21	0·6	<0·02	<0·001	<0·005	<0·001	<1·0	0·008	0·02	0·003	0·059	0·121	0·02	0·004	0·008	<0·002	0·0002	0·0004	<0·0002	0·034	0·14	<0·002
	10	0·051	0·22	"	1·5	3·8	"	"	0·4	"	"	"	"	"	"	"	<0·002	0·051	0·113	0·011	"	"	"	"	0·0008	"	0·033	0·15	"
2 - 2	1	0·05	0·06	"	1·38	3·9	"	0·25	0·6	"	"	"	"	"	0·009	0·041	0·001	0·057	0·105	0·025	"	0·009	"	"	0·0006	"	0·031	0·14	"
	10	0·037	0·11	"	1·4	4·5	"	0·158	0·4	"	"	"	"	"	0·007	0·025	"	0·076	0·141	0·02	0·008	0·041	<0·005	"	0·0004	"	0·05	0·29	"
	20	0·026	"	"	1·82	7·2	"	0·223	0·7	"	"	"	"	"	0·01	0·03	"	0·087	0·14	0·028	0·007	0·033	<0·002	0·0001	"	"	0·049	0·3	"
3 - 1	1	0·051	0·07	"	0·9	2·8	"	0·18	0·5	"		"	"		0·008	0·018	0·001	0·056	0·151	0·013	0·005	0·013	"	"	0·0002	"	0·64	0·101	"
	20	0·036	"	"	1·32	3·2	"	0·38	1·3	0·07	"	"	"	"	0·007	0·015	"	0·063	0·146	0·006	0·007	0·028	0·002	0·0002	0·0005	"	0·069	0·33	0·002
3 - 2	1	0·046	0·08	"	1·91	8·2	"	0·27	0·7	"	"	"	"	"	0·008	0·036	"	0·059	0·124	0·02	0·004	0·013	<0·002	0·0001	0·0002	"	0·092	0·64	<0·002
	15	"	"	"	0·77	1·6	"	0·26	"	0·03	"	"	"	"	0·005	0·014	"	0·068	"	0·027	"	0·011	"	0·0002	"	"	0·16	1·37	"
	30	0·061	0·17	"	0·51	1·2	"	0·158	0·6	<0·02	"	"	"	"	0·006	0·018	"	0·057	0·158	0·016	"	0·013	"	"	"	"	0·176	1·65	0·002
4 - 1	1	0·033	0·1	"	0·52	0·8	"	0·24	0·5	"	"	"	"	"	"	0·016	0·002	0·072	0·186	0·027	0·005	0·015	"	0·0004	"	"	0·038	0·16	"
	20	0·034	0·11	"	0·91	4·5	"	0·21	"	0·06	"	"	"	"	0·007	0·014	0·003	0·116	0·3	0·022	0·006	0·029	"	0·0005	0·001	"	0·109	0·57	0·003
4 - 2	1	0·042	0·09	"	0·58	1·5	"	0·23	"	"	"	"	"	"	0·005	0·021	<0·002	0·07	0·136	0·005	0·005	0·006	"	0·002	0·0004	"	0·103	0·68	0·003
	15	0·053	0·18	"	0·67	1·6	"	0·247	0·7	"	"	"	"	"	0·006	0·018	"	0·074	0·142	0·011	0·005	0·014		0·0008	0·0004	"	0·085	0·58	"
	30	0·042	0·12	"	0·74	2·1	"	0·298	0·9	0·04	"	"	"	"	"	"	"	0·079	0·18	0·015	0·004	0·013	"	"	0·0003	"	0·061	0·44	<0·002
5 - 1	1	0·03	0·07	"	0·58	1·9	"	0·324	0·6	<0·02	"	"	"	"	"	0·011	"	0·068	0·11	0·02	0·003	0·004	"	0·0001	0·0002	"	0·034	0·11	0·017
	20	0·036	0·10	"	1·16	3·8	"	0·24	0·7	"	"	"	"	"	0·007	0·021	"	0·107	0·163	0·024	0·006	0·013	<0·003	"	"	"	0·059	0·33	0·011
5 - 2	1	0·112	0·74	"	0·62	1·8	"	0·252	0·8	"	"	"	"	"	0·021	0·102	"	0·117	0·46	0·016	0·004	0·011	<0·002	0·0002	0·0006	"	0·03	0·09	0·005
	15	0·034	0·08	"	1·38	6·2	"	0·236	0·6	"	"	"	"	"	0·006	0·018	"	0·074	0·12	0·023	0·005	0·02	"	"	0·0005	"	0·033	0·074	"
	30	0·086	0·46	"	1·08	4·1	"	0·331	"	"	"	"	"	"	"	0·019	"	0·067	0·188	0·02	0·004	0·009	"	"	"	"	0·039	0·18	"
7 - 1	1	0·068	0·29	"	0·60	1·6	"	0·27	"	"	"	"	"	"	0·008	0·021	"	0·078	0·136	0·015	"	0·011	"	0·0001	0·0008	"	0·113	0·92	0·005
	20	0·069	0·2	"	0·49	1·1	"	0·242	0·5	"	"	"	"	"	0·007	0·018	"	0·068	0·171	0·026	"	0·013	"	0·0002	0·0006	0·0001	0·021	0·046	"
7 - 2	1	0·042	0·08	"	0·69	2·2	"	0·182	"	"	"	"	"	"	0·005	0·01	"	0·085	0·201	0·027	0·009	0·058	"	"	0·0002	<0·0001	0·051	0·34	0·006
	15	0·048	0·14	"	0·66	1·8	"	0·183	0·4	"	"	"	"	"	"	"	"	0·09	0·16	0·03	0·005	0·017	"	"	0·0003	"	0·024	0·054	"
	30	0·069	0·38	"	0·71	"	"	0·204	"	"	"	"	"	"	0·006	0·018	"	0·092	0·14	0·029	"	0·019	"	0·0001	0·0002	"	0·077	"	"

A

ZINC mg/l			NICKEL mg/l	SULPHATE mg/l - SO_4	T.O.C. mg/l			T.S.S. mg/l			CHLORIDE mg/l
A	B	C	A	A	A	B	C	A	B	C	A
0·034	0·14	<0·002	0·004	2600	2·3	6·0	0·9	1·9	4·0	<1·0	17465
0·053	0·15	"	0·006	2650	2·2	7·0	0·7	3·5	12·0	"	17500
0·032	0·14	"	0·004	2500	2·3	6·0	0·9	1·6	4·0	"	17465
0·05	0·29	"	"	2600	1·4	5·0	<0·3	3·6	12·0	"	17535
0·049	0·3	"	"	2650	1·5	5·0	"	1·6	4·0	"	17465
0·64	0·101	"	"	"	2·2	6·0	0·9	"	5·0	"	"
0·088	0·33	0·002	"	2600	0·8	1·0	<0·3	1·8	3·0	"	"
0·002	0·64	<0·002	0·006	2700	1·9	5·0	0·9	2·9	18·0	"	17605
0·16	1·37	"	0·008	2800	2·2	8·0	<0·3	"	6·0	"	17465
0·176	1·88	0·002	"	"	2·3	"	0·8	1·5	4·0	"	17435
0·038	0·16	"	0·004	2700	1·9	5·0	"	1·4	2·0	"	17400
0·100	0·37	0·003	0·008	2800	1·1	2·0	0·7	1·3	"	"	17600
0·103	0·68	0·003	"	2750	2·2	5·0	0·8	1·4	3·0	"	17465
0·065	0·58	"	0·007	2600	1·5	3·1	0·5	1·5	2·0	"	17535
0·061	0·44	<0·002	"	"	1·0	2·0	<0·5	1·9	3·0	"	17675
0·034	0·11	0·017	<0·004	"	1·3	2·3	0·8	2·0	4·0	"	17465
0·059	0·33	0·011	0·004	"	0·8	1·1	0·7	"	"	"	17400
0·05	0·09	0·003	<0·004	2700	1·2	2·2	"	"	6·0	"	17465
0·033	0·074	"	0·005	"	0·7	1·0	0·4	1·6	3·0	"	17435
0·039	0·16	"	<0·004	2600	"	"	<0·3	2·4	7·0	"	17400
0·113	0·82	0·009	0·009	2800	2·4	9·0	0·7	2·1	"	"	"
0·021	0·048	"	0·007	2600	1·6	3·0	0·4	2·3	4·0	"	"
0·031	0·34	0·006	0·006	2700	1·0	2·0	0·7	2·6	9·0	"	17435
0·024	0·054	"	0·01	2600	0·8	1·0	0·4	"	7·0	"	17400
0·077	"	"	"	2700	1·0	2·0	<0·3	3·0	8·0	"	"

A – Mean, B – Maximum, C – Minimum

7. PLANTS & ANIMALS

7. PLANTS AND ANIMALS

The following section documents the plants and animals of the study area as recorded by MRA's field staff. While not all species occurring in the area were encountered during the field survey, a large percentage were located and their distribution and abundance patterns were recorded.

Although actual numbers of many species were recorded, abundance records presented here are qualitative. In general, abundance was determined on the following basis:

PRESENT (P)	A species was considered to be "present", if it occurred only in small numbers and was usually difficult to locate.
COMMON (C)	A species was considered to be "common", if it was a common part of the flora and fauna and was easily observed and located.
ABUNDANT (A)	A species was considered to be "abundant" if it occurred in unusually large numbers and dominated the flora or fauna of a particular site.

Where Distribution and Abundance records are listed in the Annotated list of species, the transect or study site is given first followed by the abundance notation. For example, "1-A" indicates the species was abundant at site one. An abundance range (P-A) indicates that abundance varied from present to abundant depending on substrate or depth

PORIFERA
(SPONGES)

7.1 INTRODUCTION

Numerous species of sponges occur in the Bay of Fundy. A few occur intertidally but most are found subtidally from low water to depths of 100 feet and more; usually on hard substrates. Sponges were found to be a common component of the local fauna and were recorded throughout the study area.

While potential exists for the pharmaceutical utilization of chemicals extracted from certain species, there is no present commercial utilization of this group

7.2 ANNOTATED LIST OF SPECIES

7.2.1 CRUMB-OF-BREAD SPONGE/*Halichondria panacea* (Pallas)

Description - Irregular encrusting masses to 6 inches; often with erect chimney-like structures; yellow, green, purple.

Habitat - Intertidal and subtidal on rocks, shells and pilings.

Distribution and Abundance (Figure 7.2.1) - MRA (2-P, 4-C, 6-P, 7-C, 8-A, 9-C, 10-P, 31-P, 33-P, 34-P-C, 35-P, 36-C, 37-C, 38-P, 39-C, 40-P.)

7.2.2 DEADMAN'S FINGERS/*Haliclona (Chalina) oculata* (Linnaeus)

Description - A large (to 18 inches) upright branching sponge composed of many close-set, finger - like branches supported on a single stock; brown to soft orange-red.

Habitat - Grows abundantly subtidally on pilings and rock substrate.

Distribution and Abundance (Figure 7.2.2)-MRA (4-C, 6-P, 8-A, 9-A, 18-P, 31-P-C, 32-C, 33-P, 35-P, 36-A, 37-A, 38-P-C, 39-A).

DEAD-MAN'S FINGERS

7.2.3 IOPHON SPONGE/*Iophon pattersoni*

Description - A highly textured encrusting sponge found on living brachiopods (*Terebratulina septentrionalis*); light tan.

Habitat - Occurs most commonly on brachiopods found on rock ledges, overhangs and on the bottoms of rock debris from low water to, at least, 100 feet.

Distribution and Abundance (Figure 7.2.3)-MRA (36-A, 37-A, 39-A).

7.2.4 TUFTED SPONGE/ *Scypha (Grantia) ciliata* Fabricius

Description - Single, small (8 cm), vase-like sponge with osculum at the top; whitish-yellow.

Habitat - Moderately common subtidally on wharf pilings and floats. Also found subtidally on the undersurface of loose rocks.

Distribution and Abundance (Figure 7.2.4) 31-P, 33-C.

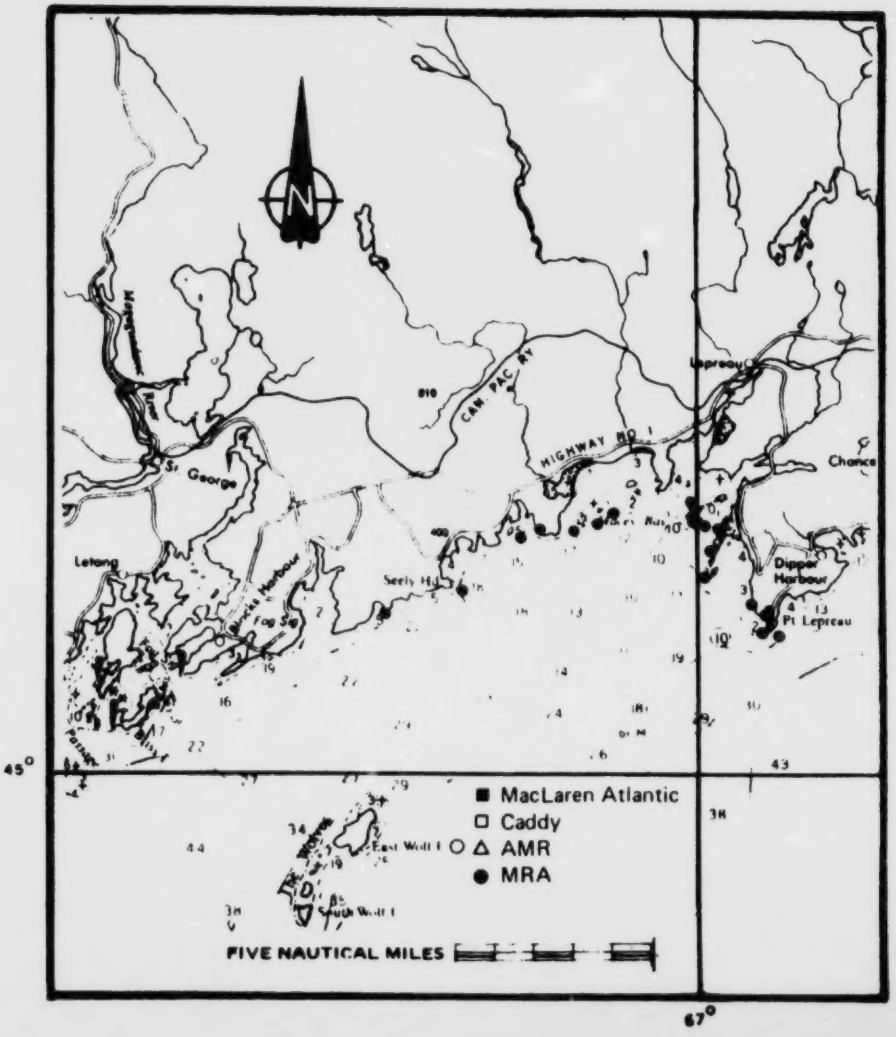
7.2.5 UNIDENTIFIED SPONGES

Unidentified species of sponges were recorded. Since it is difficult to identify many species on the basis of external morphology, these species were mapped together.

Tentative Identification, Distribution and Abundance (Figure 7.2.5)
Red encrusting species: Caddy (117-P)
Yellow Papillate Sp: Caddy (102-P, 117-C, 118-C, 119-C, 120-P 151-C.)
Cliona-like: MRA (6-P, 7-P, 8-A, 32-C; Caddy (117-C, 119-C, 120-C.
Yellow Encrusting: MRA (T1-P, T5-P).
Branching Sp: Caddy (120-P).

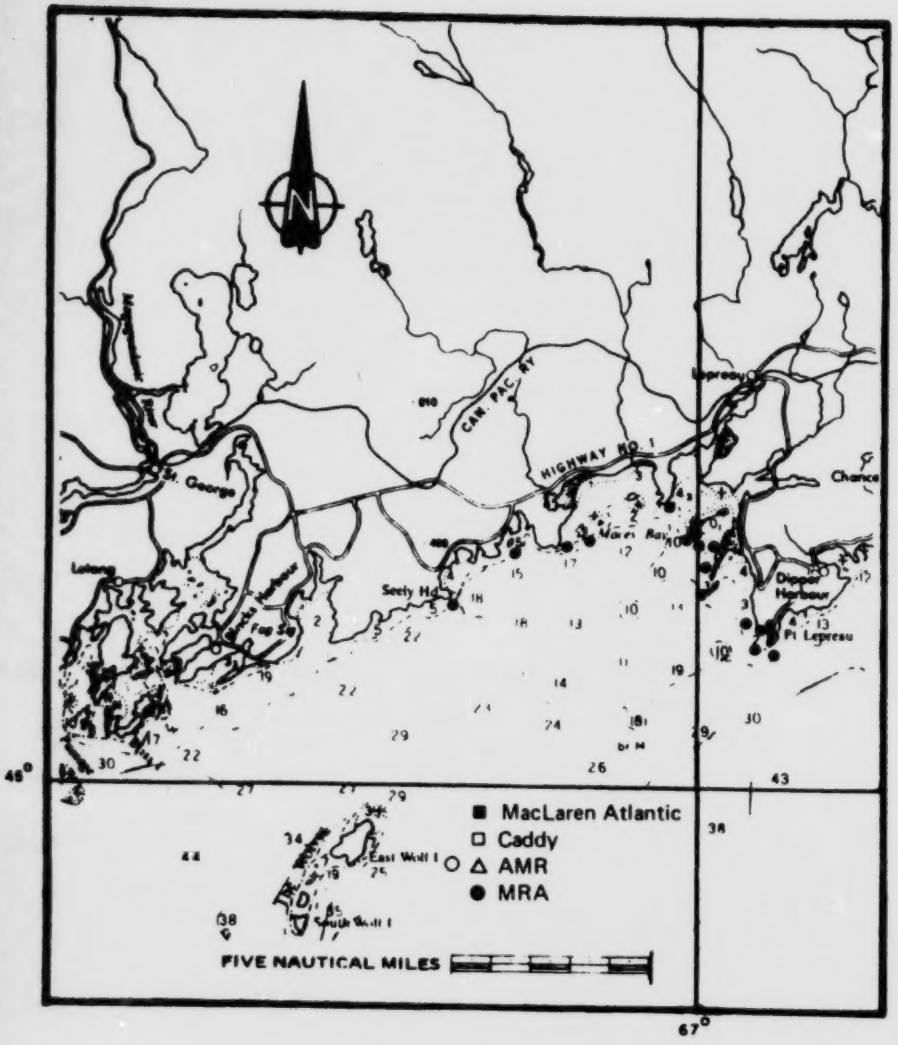
7.2.1 DISTRIBUTION OF CRUMB-OF-BREAD SPONGE

PEA POINT TO POINT LEPREAU



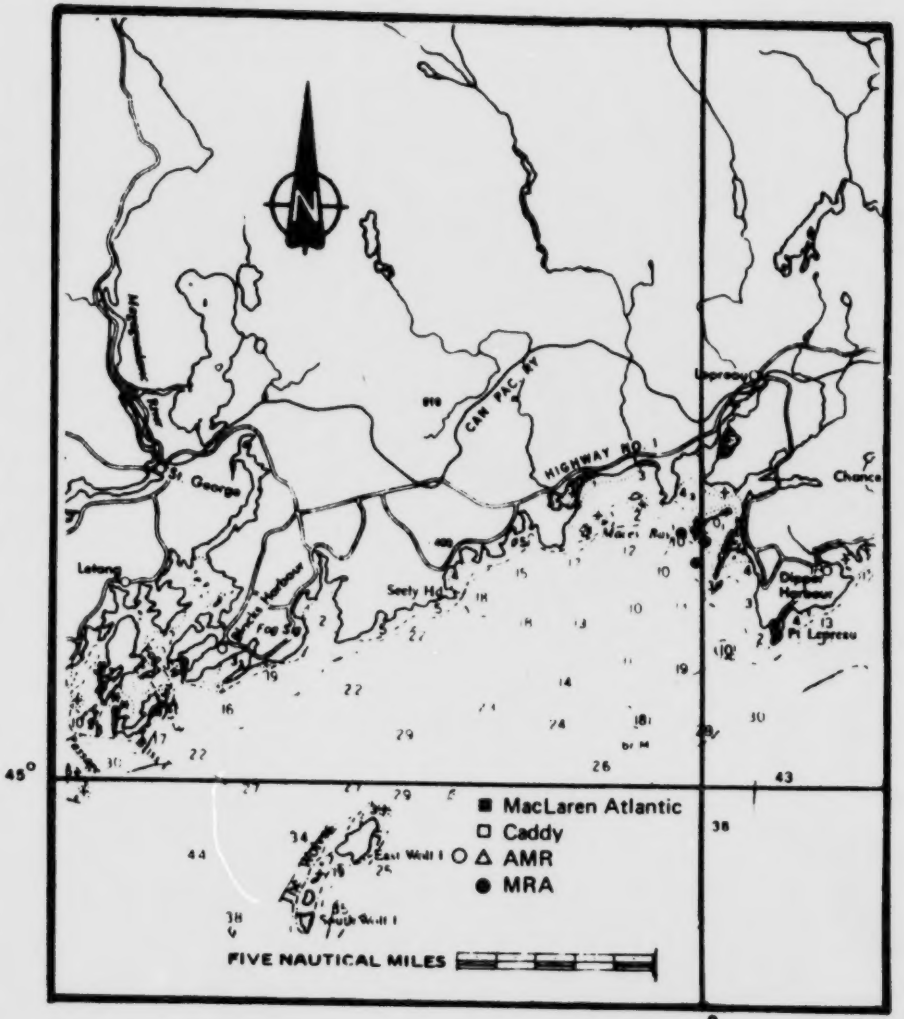
7.2.2
DISTRIBUTION OF DEADMAN'S FINGER SPONGE

PEA POINT TO POINT LEPREAU



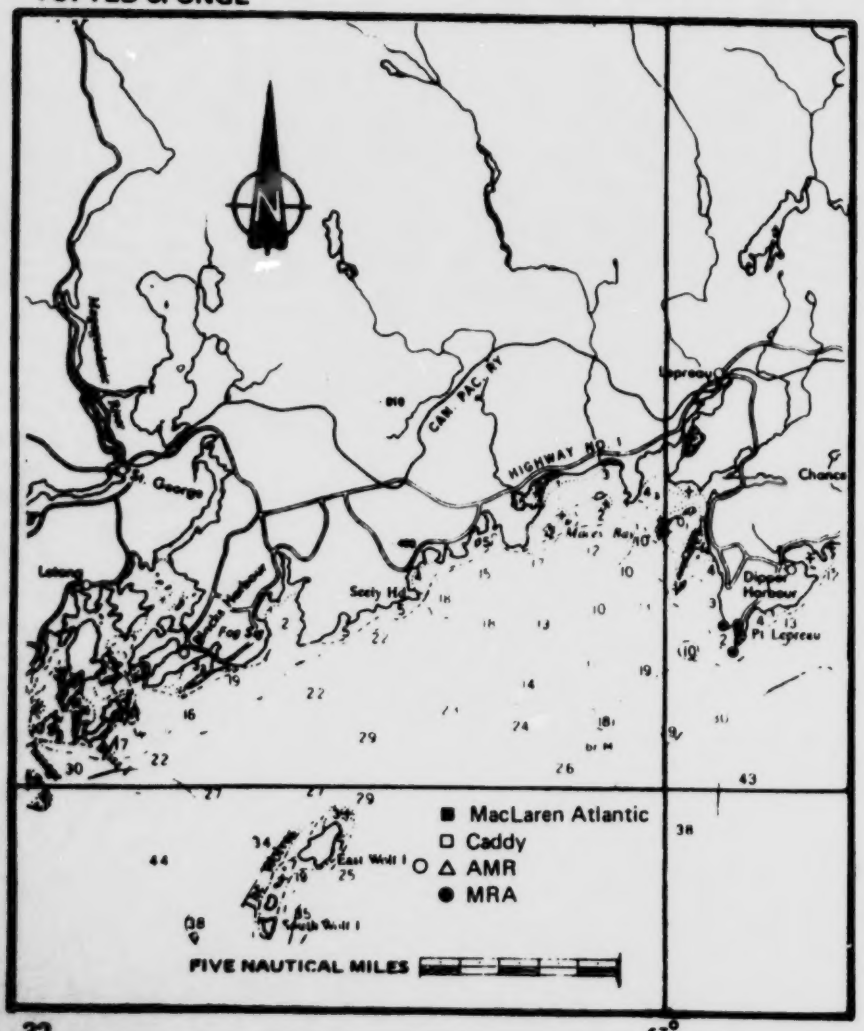
7.2.3
DISTRIBUTION OF IOPHON SPONGE

PEA POINT TO POINT LEPREAU



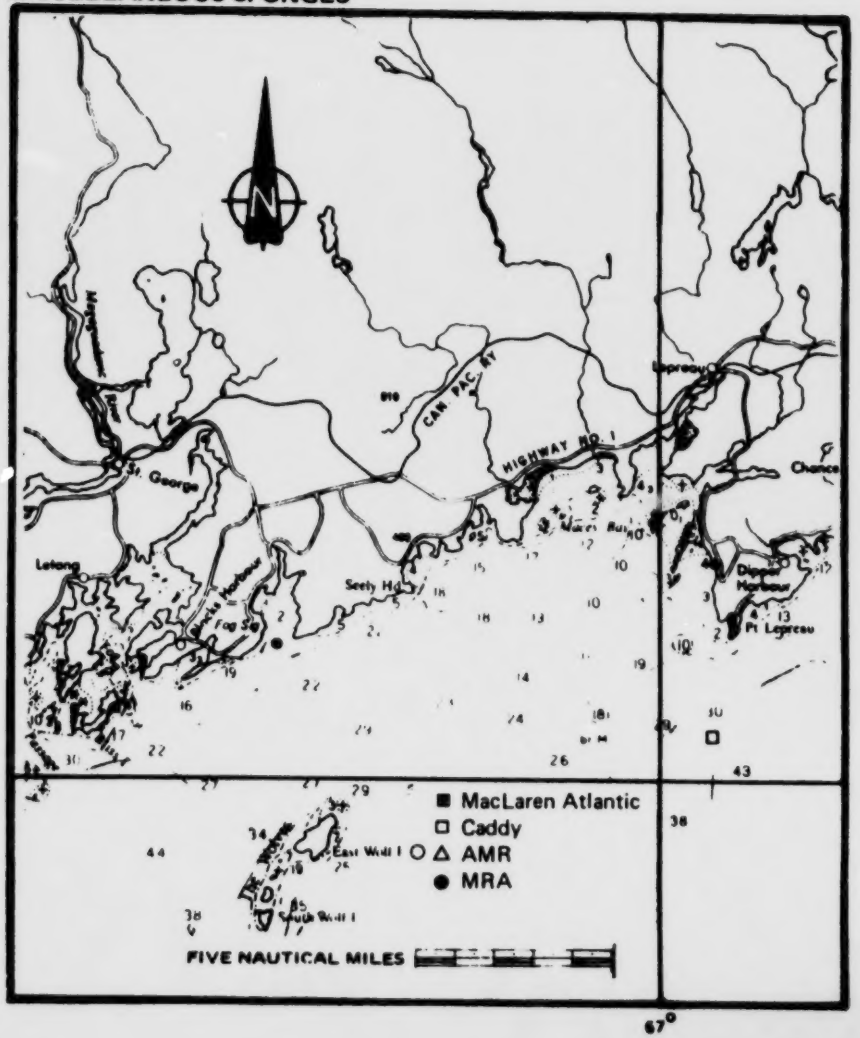
7.2.4
DISTRIBUTION OF TUFTED SPONGE

PEA POINT TO POINT LEPREAU



7.2.5
DISTRIBUTION OF MISCELLANEOUS SPONGES

PEA POINT TO POINT LEPREAU



CNIDARIA
CTENOPHORA
(JELLYFISH, ANEMONES, ETC.)
(COMB JELLIES)

7.3 INTRODUCTION

Hydroids, jellyfish, sea anemones, soft corals and other Cnidarians form an important part of the fauna of the Bay of Fundy. Most species are either subtidal or free-floating. A few, principally certain anemones and hydroids, occur intertidally; mainly in tide pools. Compared to other areas previously studied, Cnidarians are relatively poorly represented in the study area.

There is no known commercial use for Cnidarians. Nevertheless,the Moon Jellyfish (*Aurelia aurita*) occasionally occurs in extremely large numbers during the summer. At such times, this species may cause structural damage to local herring weirs due to numerous Jellyfish restricting water flow through the netting. Resistance may cause tearing of the twine and, occasionally, collapse of supporting pilings.

7.4 ANNOTATED LIST OF SPECIES

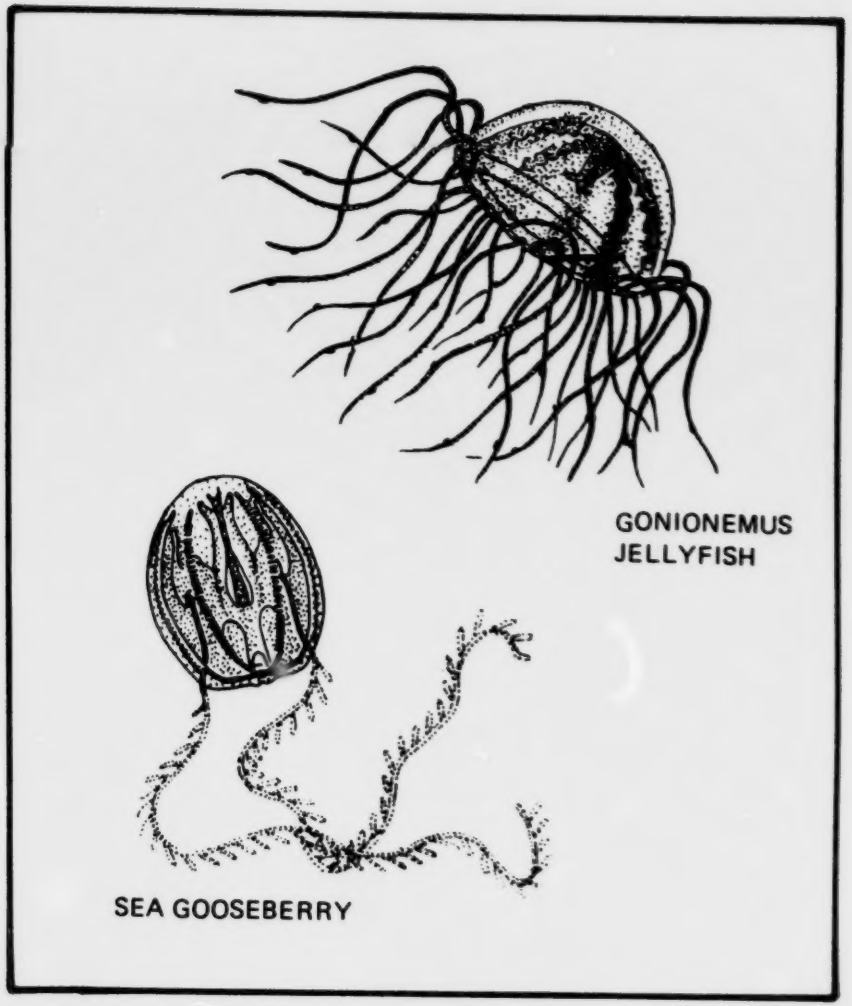
HYDROIDS

7.4.1 HYDROID/*Obelia sp.*

Description - There are several different species of *Obelia*. Some form dense branching colonies up to 10 inches in length. The tiny *Obelia geniculata* appears to be the most common species in the study area. *O. geniculata* reaches a maximum size of about 1 cm. Under a microscope it can be seen that the polyp bearing branches arise alternately from a single stalk. Color is white..

Habitat - *O. geniculata* was found commonly on the undersurface of subtidal rocks and on kelp.

Distribution and Abundance (Figure 7.4.1) - MRA (9-A, 10-P, 32-A, 33-P, 34-C, 36-P, 37-P, 39-P).



7.4.2 PINK-HEARTED HYDROID/*Tubularia sp.*

Description - This hydroid usually occurs in clusters composed of several to dozens of individuals. Polyps are small but visible to the naked eye and occur singly on a 6 cm. stalk. Color - polyps are pink, stalks white.

Habitat - This species occurs most abundantly, subtidally, on pilings, wharves and weir twine. It also occurs commonly, in some areas, on rocky bottom. It is common to abundant on such habitat in the study area.

Distribution and Abundance (Figure 7.4.2) - MRA (4-C, 6-P, 7-P, 8-A, 9-C-A, 32-P-C, 33-C, 34-P-C, 35-P, 36-P, 37-P, 39-P).

JELLYFISH

7.4.4 MOON JELLYFISH/*Aurelia aurita* (Linnaeus)

Description - This is the common Fundy Jellyfish. Reaching a foot or more in diameter when mature, it is easily distinguished by its form and four circular gonad rings. Color-transparent and white.

Habitat - Free-swimming as Jellyfish. Overwintering scyphistoma occur under rocks subtidally and in tide pools and under wharves and floats.

Commercial Importance - As previously mentioned, large numbers of this species may cause damage to weirs.

Distribution and Abundance - While the Moon Jellyfish was only recorded at two sites it occurs abundantly, at certain times, in local waters.

7.4.5 RED ARCTIC JELLYFISH/*Cyanea capillata* (Linnaeus)

Description - This large (to 50 cm) Jellyfish is distinguished by a massive red and brown body and long trailing tentacles. Some people react to the sting of this species.

Habitat - Free-swimming medusae are usually rare in this area. However, in some years they occur in fairly large numbers during the summer months.

Distribution and Abundance - 7-C. While not common during this survey, the Red Arctic Jellyfish will occur commonly in the waters of the study area during some years.

7.4.6 STAUROMEDUSA/*Lucernaria sp.*

Description - Stauromedusae are sessile Jellyfish usually found attached to subtidal rock or kelp by a single stalk. This species found at the Wolves is tentatively assigned to the Genus *Haliclystus*

Distribution and Abundance - 32-P.

ANEMONES

7.4.7 COMMON ANEMONE/*Metridium senile* (Linnaeus)

Description - This is the Common Fundy Anemone. It has typical anemone form and reaches 20 cm in height. Color varies from white, brown, red, orange, occasionally mottled.

Habitat - Common subtidally on pilings, weirs, floats, wharves and rocky substrate. Small individuals are occasionally found in tide pools.

Distribution and Abundance (Figure 7.4.3) - MRA (1-A, 4-C, 8-A, 10-P, 20-P, 32-P, 33-P, 35-P).

7.4.8 BURROWING ANEMONE/*Cerianthus borealis* (Verrill)

Description - Commonly referred to as "sloppy guts" this large (25 cm) burrowing anemone secretes a grey gelatinous tube in which it lives. The animal itself is light brown with large tentacles striped with green.

Habitat - Subtidally in sand, muddy sand and loose bottom. Usually in deep water.

Distribution and Abundance T4-P.

7.4.9 GREEN ANEMONE/*Bunodactis stella* (Verrill)

Description - This is a small (to 50 mm wide) green anemone

Habitat - Commonly found intertidally in tide pools and moist cracks in ledge.

Distribution and Abundance -(Figure 7.4.5) - T1-P, T3-P, T5-P, 27-P

7.4.10 BURROWING ANEMONE/*Edwardsia sipunculoidea*

Description, Habitat and Abundance - This small intertidal species occurs in sand and muddy sand. Observed at only one site - 126-P.

7.4.11 UNIDENTIFIED ANEMONE

Description, Habitat, Distribution and Abundance (Figure 7.4.4) - A small unidentified anemone was observed on ledge at the following sites: T1-P, 5-C, 13-P, 19-P.

SIPHONOPHORES

7.5 SIPHONOPHORE/*Cupulita cara*

Description, Habitat, Distribution and Abundance -Siphonophores include By-the-wind Sailors and Portuguese Man-of-war. Locally this group is represented by a single species, *Cupulita cara*. This is a free-swimming animal which occurs as long string-like colonies growing to 50 cm or more. This species occurs abundantly in surrounding waters at irregular intervals.

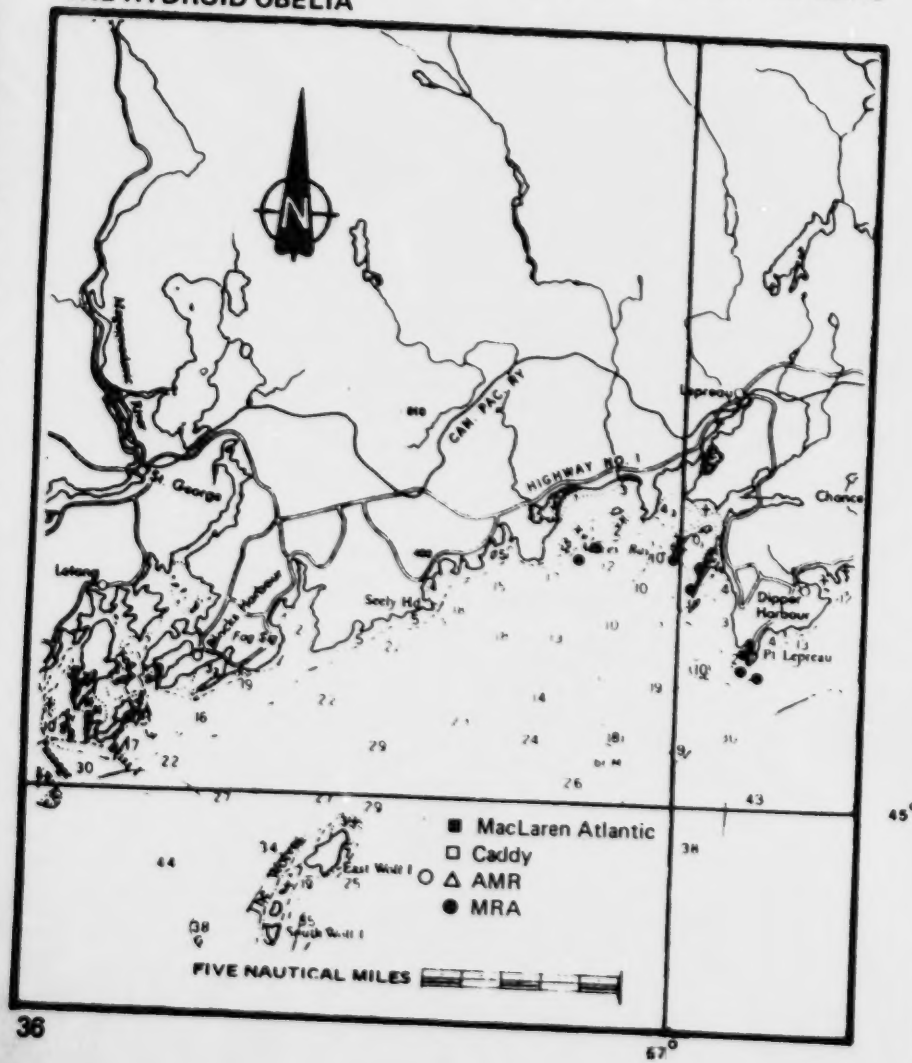
COMBJELLIES

7.6 COMBJELLIES/*Beroe cucumis* Fabricius

Description, Habitat, Distribution and Abundance - Comb-jellies are small free-swimming animals which occur abundantly in the area at irregular intervals. Species which occur in the area include: *Pleurobrachia pileus* (Fabricius), *Mertensia ovum* (Fabricius), *Bolinopsis infundibulum* Müller, *Bolina alata* Agassiz and *Beroe cucumis*. While combjellies were not recorded during this survey, they occur abundantly at irregular intervals.

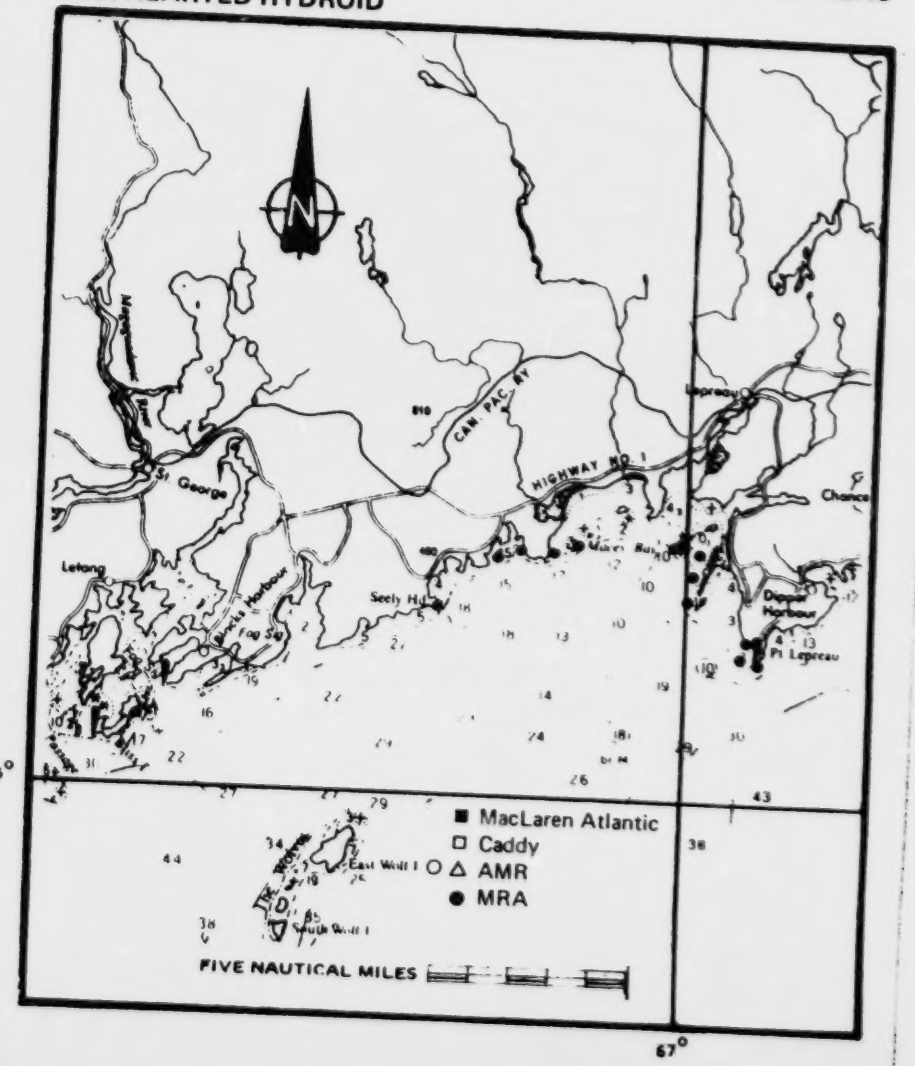
7.4.1
DISTRIBUTION OF THE HYDROID OBELIA

PEA POINT TO POINT LEPREAU



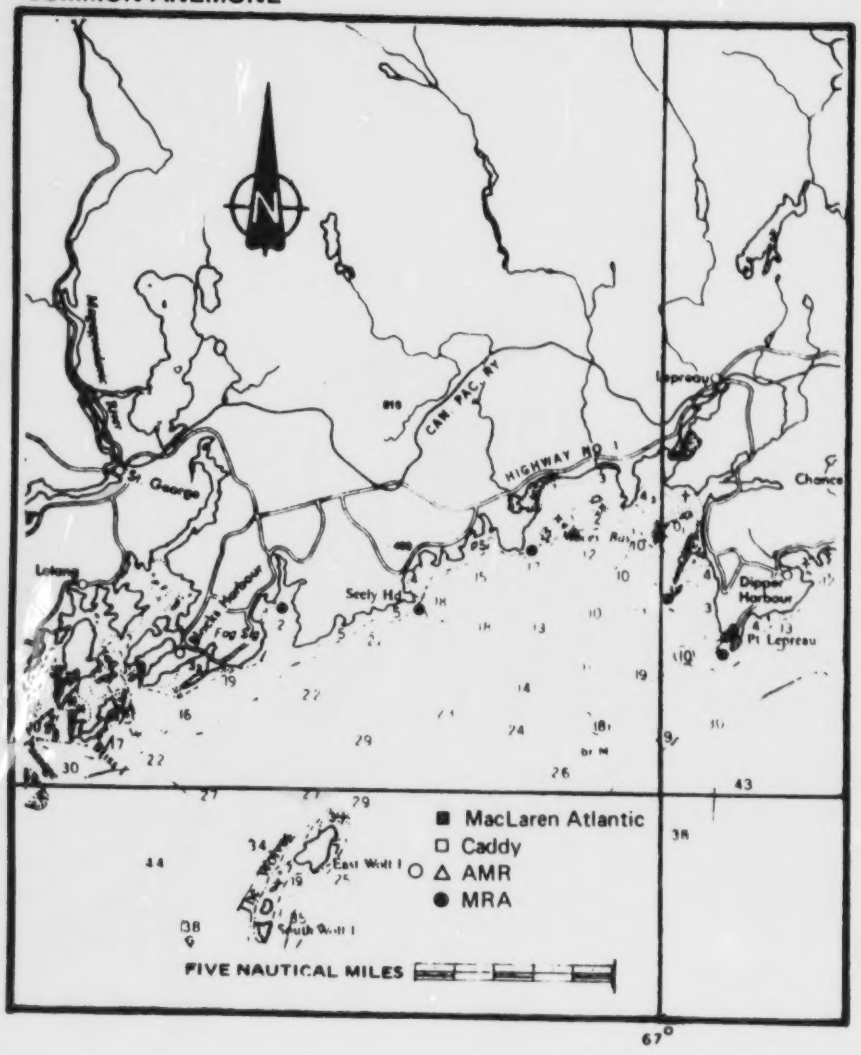
7.4.2
DISTRIBUTION OF THE PINK-HEARTED HYDROID

PEA POINT TO POINT LEPREAU



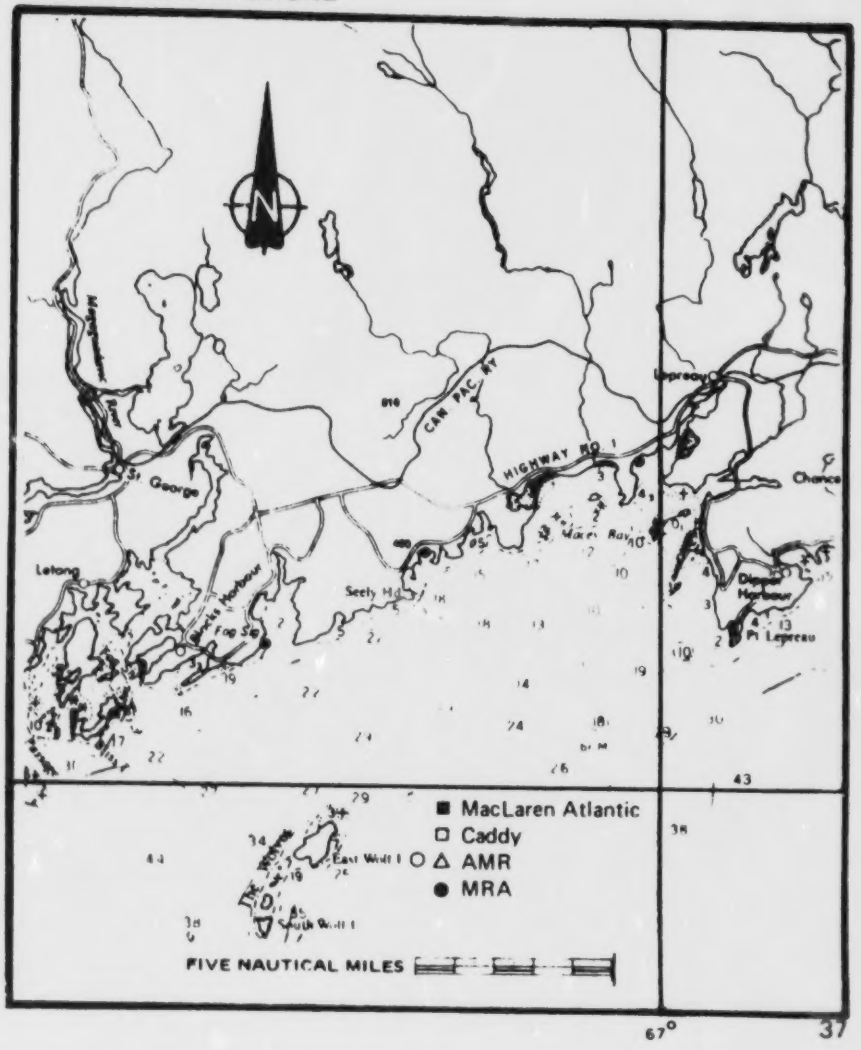
7.4.3
DISTRIBUTION OF COMMON ANEMONE

PEA POINT TO POINT LEPREAU



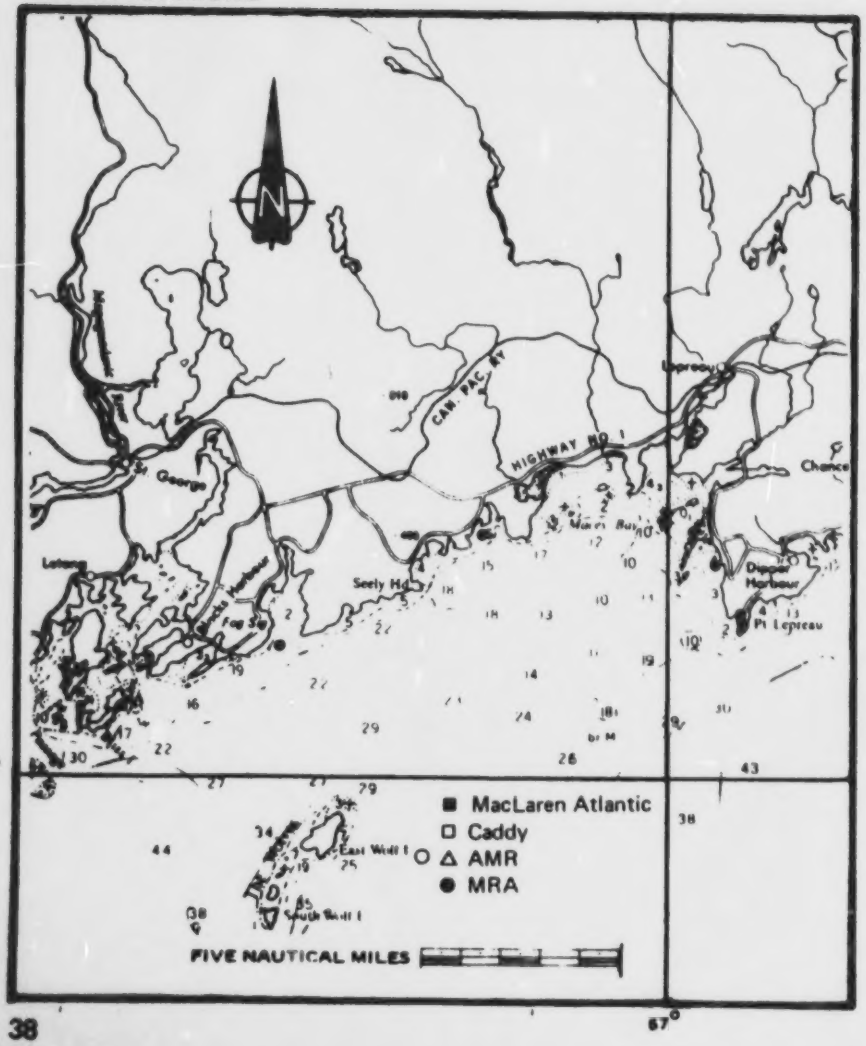
7.4.4
DISTRIBUTION OF UNIDENTIFIED ANEMONE

PEA POINT TO POINT LEPREAU



7.4.5
DISTRIBUTION OF GREEN ANEMONE

PEA POINT TO POINT LEPREAU



ECTOPROCTA
BRACHIOPODA
(MOSS ANIMALS & BRACHIOPODS)

BRYOZOANS

7.7 MOSS ANIMALS/*Bryozoans*

General - Bryozoans are of diverse, widespread and abundant occurrence in the study area. They occur intertidally but most commonly subtidally. Species identification is difficult and time consuming and was beyond the scope of this study. Nevertheless, general distribution and abundance was recorded for three broad groupings: 1) Subtidal erect branching, 2) Subtidal encrusting, and 3) Intertidal branching.

Distribution and Abundance

Encrusting Species - (Figure 7.7.1) - T1-P, 27-C, 30-P, 31-P, 33-P, 34-P-A, 35-P, 38-C.

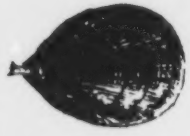
Erect Branching -(Figure 7.7.2) - T1-P, T5-P-C, 19-P, 25-C, 28-P, 30-P, 31-P-C, 33-P, 34-P-C.

Bugula sp - Caddy -(102-P, 120-P.)

Flustrellidra hispida -(Figure 7.7.3)- MRA-(T1-P, T5-P); MacLaren (2-P).

BRACHIOPODS

7.8 ATLANTIC BRACHIOPOD/*Terebratulina septentrionalis* (Couthouy)

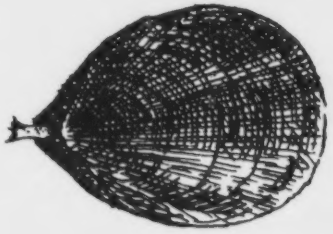


General - Brachiopods are a primitive group of bivalve-like animals which are represented by only one species (*T. septentrionalis)* in the Bay of Fundy.

Description - Small (2 cm); 2 valves; attached to the substrate by a short stalk emerging from the hinge.

Habitat - From low water to depths in excess of 100 feet. Found on rock substrate. In shallow water this species occurs under rocks and overhangs. In deep water it occurs on the uppermost surfaces of rocks and ledges. It is common on typical habitat in the study area.

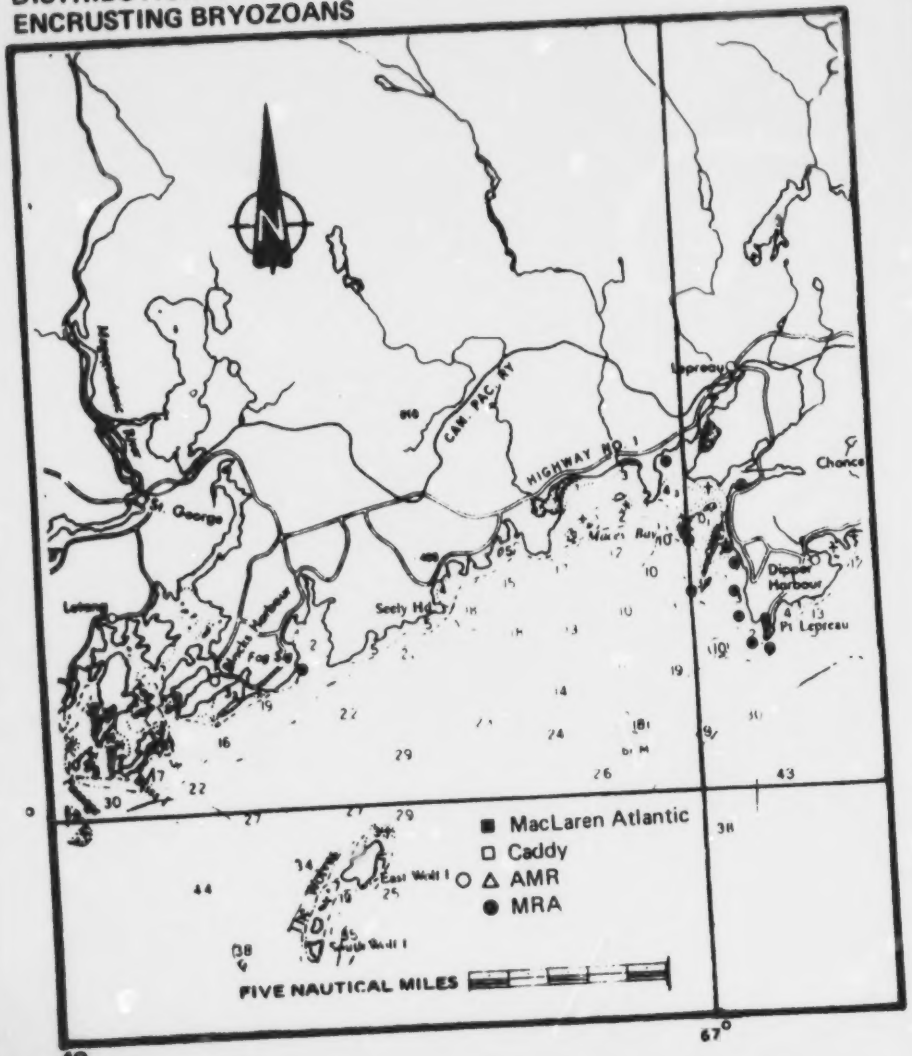
Distribution and Abundance (Figure 7.8.1) - MRA (4-C, 9-C-A, 31-P, 32-C, 36-A); Caddy (117-C, 118-C, 119-A, 120-P, 151-P, 152-C).



ATLANTIC BRACHIOPOD

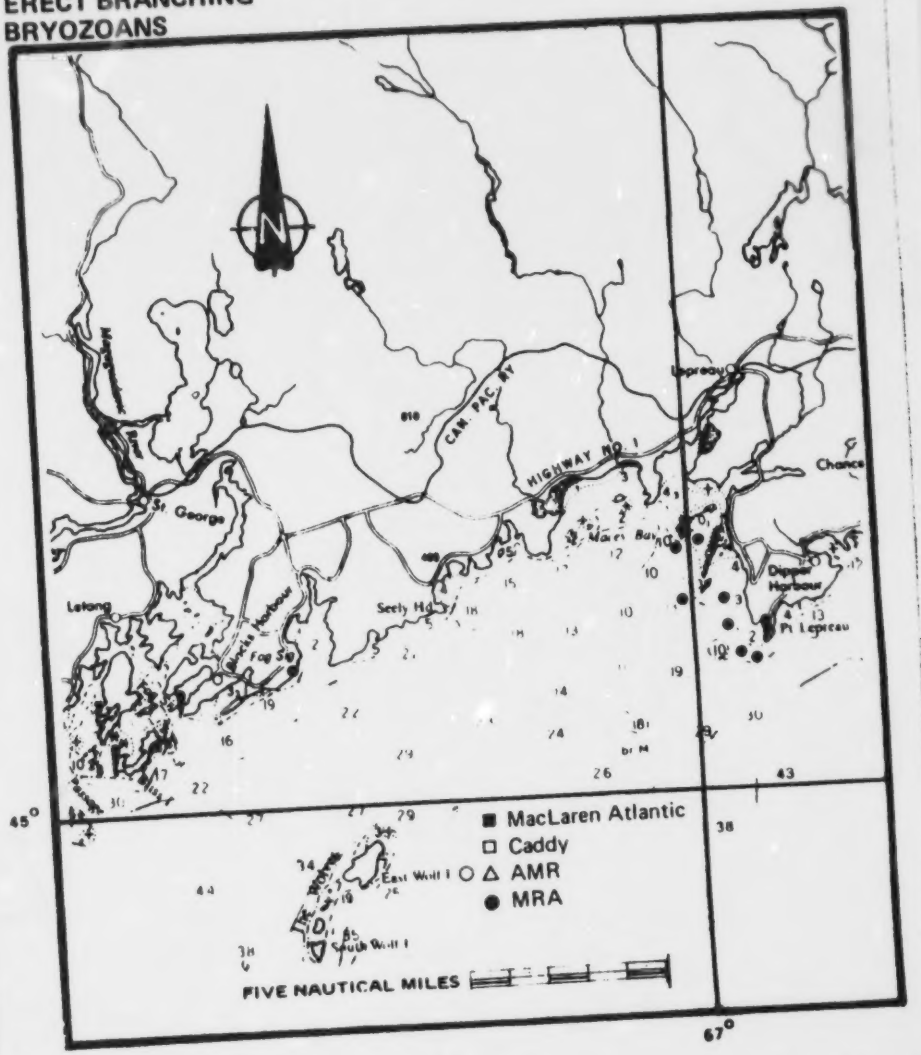
7.7.1 DISTRIBUTION OF ENCRUSTING BRYOZOANS

PEA POINT TO POINT LEPREAU



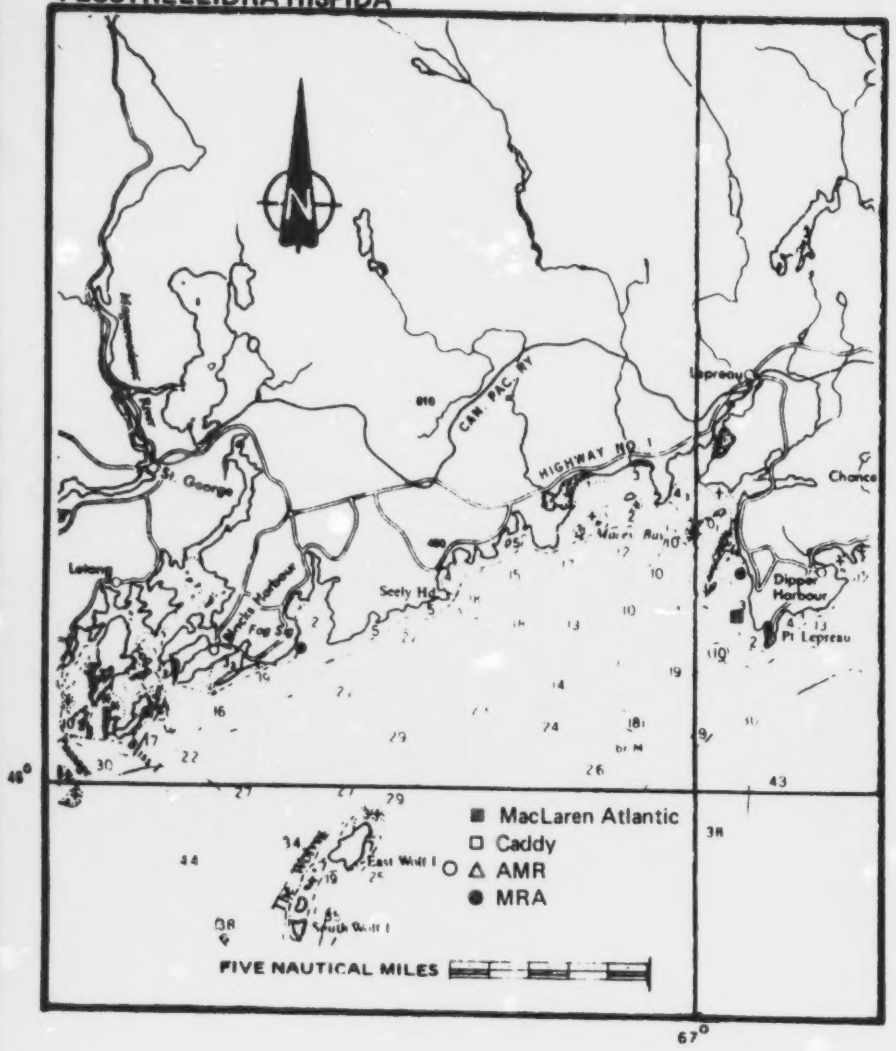
7.7.2 DISTRIBUTION OF ERECT BRANCHING BRYOZOANS

PEA POINT TO POINT LEPREAU



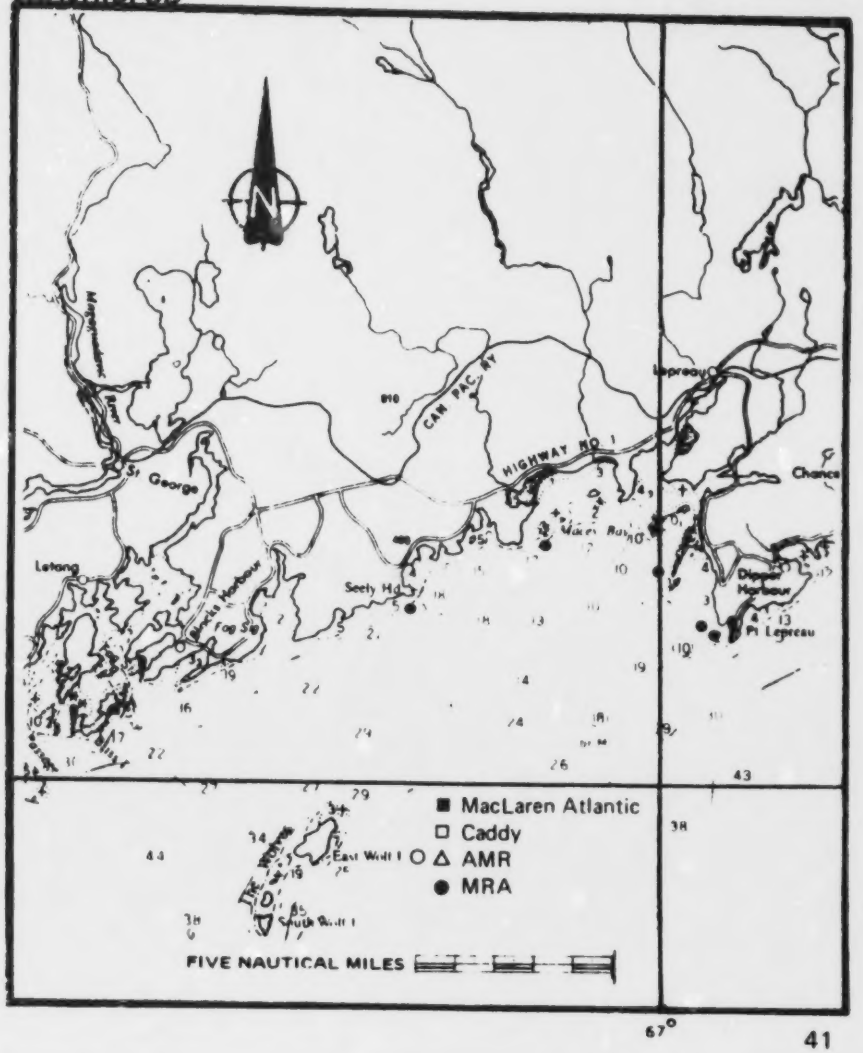
7.7.3
DISTRIBUTION OF
FLUSTRELLIDRA HISPIDA

PEA POINT TO POINT LEPREAU



7.8.1
DISTRIBUTION OF
THE ATLANTIC
BRACHIOPOD

PEA POINT TO POINT LEPREAU



MOLLUSCA
(CLAMS, SNAILS, SLUGS, SQUID)

7.9 INTRODUCTION

Clams, snails, nudibranchs and other molluscs form one of the most diverse and common groups in the Bay of Fundy. Over 27 species were recorded in the study area where they are an important part of the fauna. They occur everywhere, from high water to great depths, and on virtually every substrate.

Many species are important commercially or have potential for commercial utilization.

7.10 ANNOTATED LIST OF SPECIES

CHITONS AND LIMPETS

7.10.1 COMMON LIMPET/*Acmaea testudinalis* (Muller)

Description - This small (3 cm) cone-shaped mollusc clings to rock surfaces by a well developed muscular foot. Color-dull cream, bluish grey, irregular bars.

Habitat - Occurs commonly on rock surface intertidally above low water and to 30 or 40 feet subtidally.

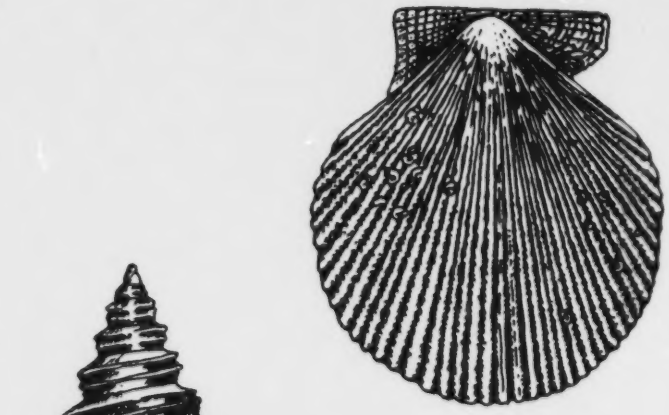
Distribution and Abundance (Figure 7.10.1) - MRA (T5-P-C, 1-P, 2;A, 3,C, 4-P, 5-P, 15-P, 17-P-C, 18-C, 19-P, 27-P, 30-P, 32-A, 33-C, 34-P, 35-P, 36-C-A, 37-C-A, 38-P, 39-C-A); MacLaren (1-P, 3-P, 4-P, 5-P, 6-P, 7-P, 8-P, 9-P); AMR (1-P). MRA (T1-P, T3-P, 28-P-C, 31-P).

7.10.2 RED CHITON/*Ischnochiton ruber* (Linnaeus)

Description - A small (2 5 cm) clinging mollusc characterized by rows of dorsal plates Color-red, mottled

Habitat - Occurs on rock from low water to 100 feet and more

Distribution and Abundance (Figure 7.10.2) - MRA (7-P, 8-P, 9-P, 10-P, 28-P, 31-P, 33-P, 34-P, 35-P. 36-C, 37-C, 39-C).



ICELAND SCALLOP

TEN-RIDGED WHELK

7.10.5 COMMON PERIWINKLE/*Littorina littorea* (Linnaeus)

Description - A small (3 cm) snail of typical form. Brownish with grey black bands.

Habitat - Occurs intertidally on all substrates. Found in shallow subtidal areas in some localities.

Commercial Utilization - This species is gathered commercially in some areas of the Bay of Fundy.

Distribution and Abundance (Figure 7.10.3) - MRA (T1-P, T2-P-C, T3-P-A, T5-P-C, 11-P-C, 13-C, 14-P, 15-P-C, 16-P-C, 17-P-C, 19-P, 20-C, 21-P-C, 22-P, 25-P, 26-A, 27-P-C, 28-C, 29-C, 30-P); AMR ((1-P); MacLaren (1-P, 2-P, 3-P, 4-P, 5-P, 6-P, 7-P, 8-P, 9-P).

7.10.4 SMOOTH PERIWINKLE/ *Littorina obtusata* (Linnaeus)

Description - A small (to 13 mm) periwinkle with a smooth, shiny shell; brownish-yellow to dark brown; occasionally banded.

Habitat - Intertidal on rocky shores.

Distribution and Abundance (Figure 7.10.4) - MRA (T1-P, T5-P-C, 5-C, 11-P, 13-P, 15-P, 17-P-C, 20-C, 21-P-C, 22-P, 27-P-C, 30-P); MacLaren (1-P, 2-P, 3-P, 4-P, 5-P, 6-P, 7-P, 8-P, 9-P); Thomas (5-P).

7.10.5 ROUGH PERIWINKLE/*Littorina saxatilis* (Olivi)

Description - A small (to 18 mm) periwinkle; grey to dark brown; sometimes mottled with yellow, brown or black.

Habitat - Upper intertidal area of rocky shores.

Distribution and abundance -(Figure 7.10.5) - MRA (T1-P-C, T2-P, 5-C, 11-P, 12-P, 13-P, 14-P, 15-P, 17-P-C, 20-C, 21-P-C, 22-P, 27-P-C, 28-P, 29-P, 30-P); MacLaren (1-P, 2-P, 3-P, 4-P, 5-P, 6-P).

7.10.6 TEN–RIDGED WHELK/*Neptunea decemcostata* (Say)

Description - A large (11 cm) snail characterized by prominent ridges. Color-light tan.

Habitat - Occurs subtidally on rock, sand and mixed substrate.

Commercial Utilization - While this snail is considered edible, its limited abundance and limited marketability probably preclude utilization.

Distribution and Abundance (Figure 7.10.6) - MRA (T4-P, 3-C, 8-P, 31-P, 33-P, 35-P, 36-P, 37-P, 38-P, 39-P); Caddy (151-P, 152-P).

7.10.7 NORTHERN WHELK/*Buccinum undatum* Linnaeus

Description - A large (10 cm) snail. Color-yellowish brown.

Habitat - Occurs subtidally on rock, mud, sand and mixed substrate.

Commercial Utilization - This is an edible snail with limited acceptance. While of widespread occurrence a-bundance is low and potential for a fishery appears poor.

Distribution and Abundance (Figure 7.10.7) - MRA (T1-P, T4-P, 4-C, 7-P, 8-A, 9-P, 18-P, 26-P, 31-P, 34-P, 35-P, 36-P, 37-P, 39-P, 40-P); MacLaren (1-P).

7.10.8 STIMPSON'S WHELK/*Colus stimpsoni* (Morch)

Description - A large (10 cm) spindle-shaped snail. Color-white and brown.

Habitat - Occurs subtidally on rock, sand and mixed substrate.

Commercial Utilization - While this snail is considered edible, low population size and limited market acceptance precludes commercial utilization.

MRA (T5-P).

7.10.9 LORA/*Oenopota (Lora) elegans* (Muller)

Description - A small (up to 21 mm) gastropod. White to light brown.

Distribution and Abundance - T5-P-C.

7.10.10 DOG WHELK/*Thais lapillus* (Linnaeus)

Description - A small (to 46 mm) snail characterized by a highly sculptured shell.

Habitat - Common interridally,particularly on rocky shores where its egg capsules are commonly found under rocks.

Distribution and Abundance - (Figure 7.10.8) - MRA (T1-P, T2-P-C, T3-P, T5-P, 13-C, 14-P, 17-P, 20-P, 21-C, 27-C, 28-P, 29-P-C, 30-P); MacLaren (1-P, 2-P, 3-P, 4-P, 4-P, 5-P, 6-P, 7-P, 8-P, 9-P).

7.10.11 MOON SNAIL/*Lunatia heros* (Say)

Description - Large circular snail reaching 10 cm. Color is white and grey.

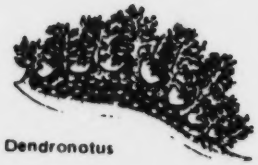
Habitat - Occurs intertidally and subtidally on sand and muddy sand bottom.

Distribution and Abundance
11-P.

7.10.12 NUDIBRANCHS/*Coryphella sp, Aeolidia papillosa* (Linnaeus), *Onchidorus sp, Dendronotus frondosus* Ascanius, etc.

Aeolidia

Coryphella



Dendronotus

Onchidorus

Description - This group resemble terrestrial slugs. Form varies as shown in the accompanying drawings.

Habitat - Most commonly found subtidally on rocky substrate organisms, particularly near hydroids on which many species feed. Some species occur in tide pools.

Distribution and Abundance (Figure 7.10.9)
Coryphella sp - T4-P, 6-P, 33-P, 34-P.
Onchidorus sp. - T4-P, 8-A, 31-P.
Dendronotus frondosus - 8-A, 34-P-C.

BIVALVES

7.10.13 GIANT SEA SCALLOP/*Placopecten magellanicus* (Gmelin)

Description - A large bivalve reaching 20 cm in diameter. Color-brown, tan upper valve, and whitish bottom valve.

Habitat - Occurs subtidally on sand, sandy mud and mixed bottoms.

Commercial Utilization - This species is fished commercially in the study area. See the section on the fishery for further information.

Distribution and Abundance (Figure 7.10.10) - MRA (T4-P, 8-P, 34-P, 36-P, 37-P, 39-C); AMR (1-P).

7.10.14 JINGLE SHELL/*Anomia simplex* d'Orbigny

Description - A flattened irregular oval; smooth, thin valves; whitish.

Habitat - Common subtidally on stones, shells and kelp.

Distribution and Abundance - (Figure 7.10.11) - MRA (8-C, 28-C); MacLaren (2-P); Caddy (117-C, 118-P, 151-C).

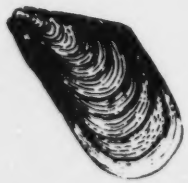
7.10.15 OCEAN QUAHOG/*Arctica islandica* (Linnaeus)

Description - A large (138 mm) ocean clam. Young are white with yellowish-brown periostracum; brown or black in adults.

Habitat - Occurs subtidally in sand.

Distribution and Abundance - 17-P.

BLUE MUSSEL/*Mytilus edulis* Linnaeus



Description - An elongated bivalve reaching 8 cm. Color-dark blue and black.

Habitat - Most common on rock substrate near low water.

Commercial utilization - Blue mussels are abundant in the study area and may have commercial potential.

Distribution and Abundance (Figure 7.10.12) - MRA (T1-P-A, T3-P, T5-P-A, 1-P, 4-A, 6-A, 7-A, 8-A, 14-P, 16-P, 19-P, 20-C, 22-P, 23-P, 25-C, 26-A, 27-P-A, 31-P, 34-P) AMR (1-P); MacLaren (1-P, 2-P, 3-P, 4-P, 5-P, 6-P); Thomas (2-P, 5-P).

7.10.17 HORSE MUSSEL/*Modiolus modiolus* (Linnaeus)

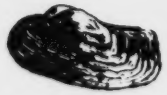
Description - This is a large (16 cm) bivalve resembling the blue mussel. Color - bluish black.

Habitat - Occurs most commonly subtidally attached to rocky substrates. Occasionally found buried in mud and sand in tide pools and near low water.

Commercial Utilization The adductor muscle of this species is edible and marketable. Potential exists for harvesting by divers.

Distribution and Abundance (Figure 7.10.13)-MRA (3-P, 4-A, 6-C, 7-P, 8-A, 9-A, 10-A, 18-C, 30-P, 31-C-A, 34-P, 35-C-A, 36-C-A, 37-C-A, 39-C-A, 40-P); AMR (1-P, 3-P);MacLaren (2-P).

7.10.18 ARCTIC SAXICAVE/*Hiatella arctica* (Linnaeus)



Description A small (5 cm) clam with poorly formed valves; white.

Habitat Occurs subtidally with other bivalves on rock bottom, on pilings, floats and wharves. Occasionally found intertidally.

Distribution and Abundance - 8-P.

7.10.19 ASTARTE/*Astarte sp.*

Description - A small (32-38 mm) yellowish-brown clam distinguished by prominent concentric ridges following the shape of the shell.

Habitat - Common subtidally in sand, muddy-sand and firm mud substrates.

Distribution and Abundance - Caddy (151-P). 11-P.

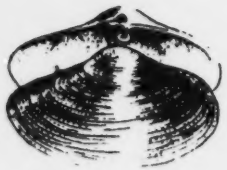
7.10.20 NORTHERN HEART SHELL/*Venericardia borealis* (Conrad)

Description - Up to 38 mm. Color-greyish white. Valves have distinct rays running from the hinge to the outer margins.

Habitat - Common subtidally in sand, muddy-sand and firm mud substrates.

Distribution and Abundance - Caddy (118-P).

7.10.21 SOFT-SHELLED CLAM/*Mya arenaria* Linnaeus



Description A plain white clam reaching 8 cm

Habitat Occurs intertidally in mud, muddy sand and sand.

Commercial Utilization - This is an important commercial species harvested from the study area.

Distribution and Abundance (Figure 7.10.14). MRA (T3-P-C, 5-P, 13-P, 22-P-C, 23-P, 24-P-A, 25-P, 26-P); MacLaren (1-P); Thomas (10-P, 11-P, 23-P, 24-P, 25-P).

7.10.22 MACOMA/*Macoma balthica* (Linnaeus)

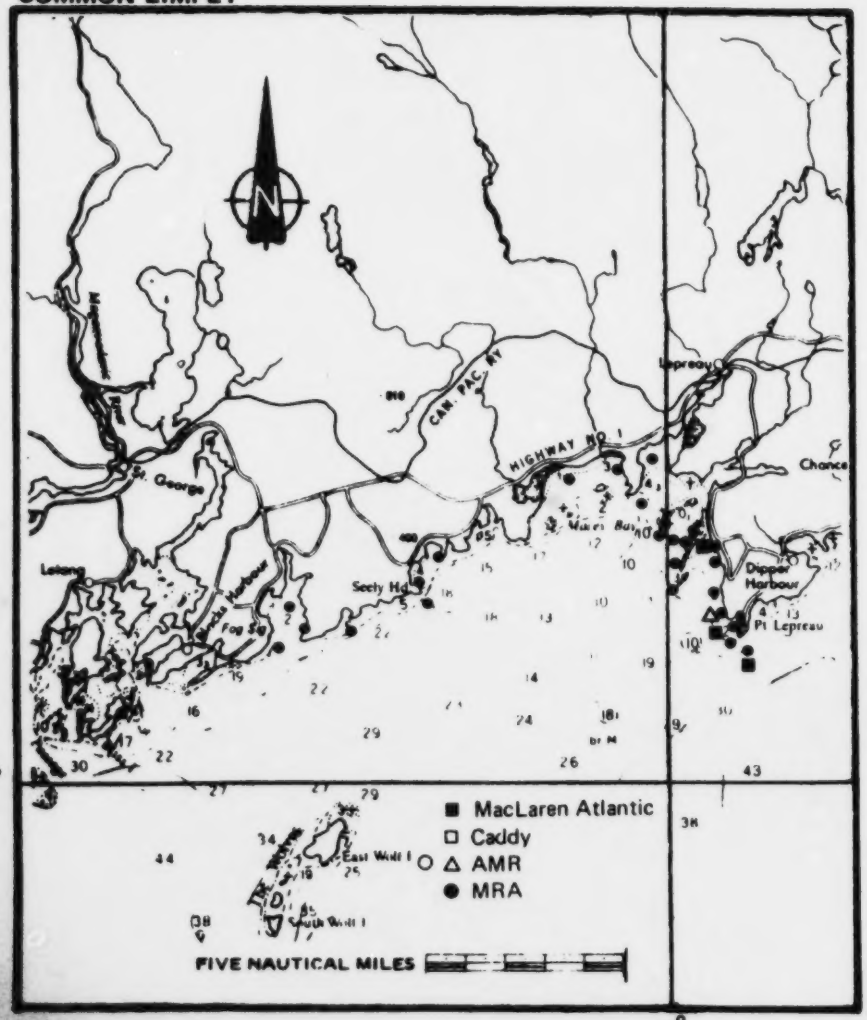
Description - A small (25 mm) oval clam; whitish.

Habitat - Common intertidally in mudflats.

Distribution and Abundance - Abundant in Little Lepreau Basin.

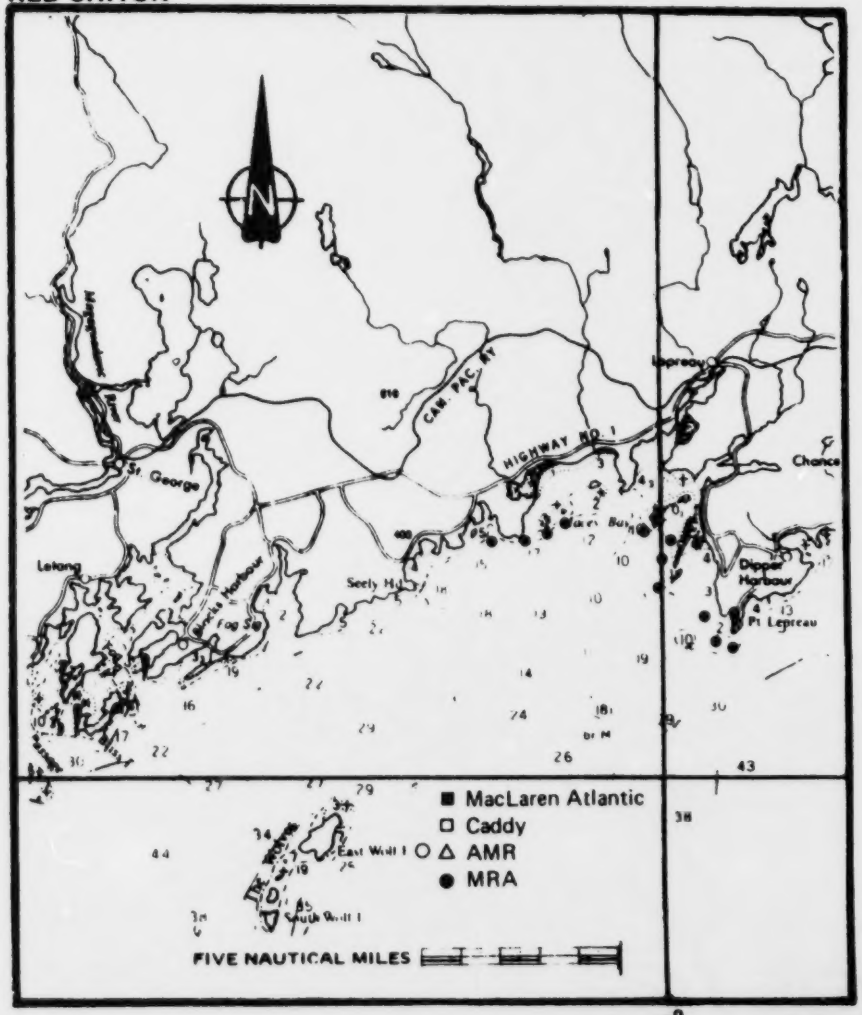
7.10.1
DISTRIBUTION OF THE COMMON LIMPET

PEA POINT TO POINT LEPREAU



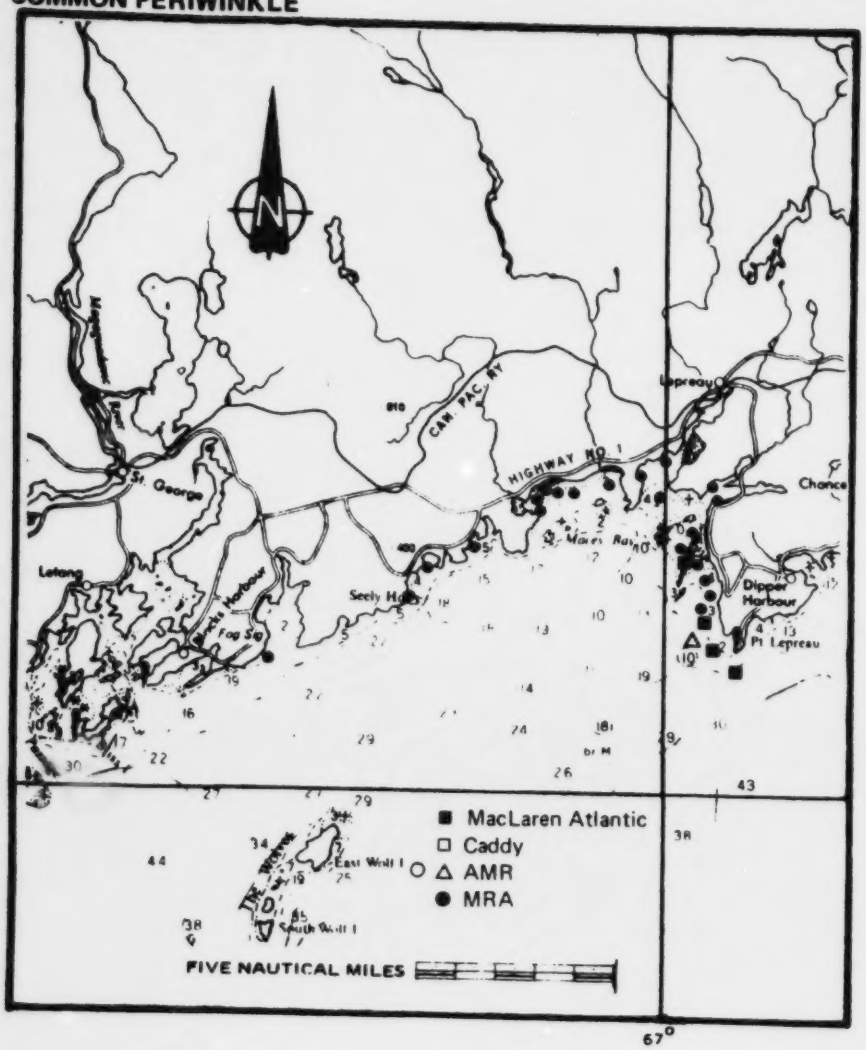
7.10.2
DISTRIBUTION OF THE RED CHITON

PEA POINT TO POINT LEPREAU



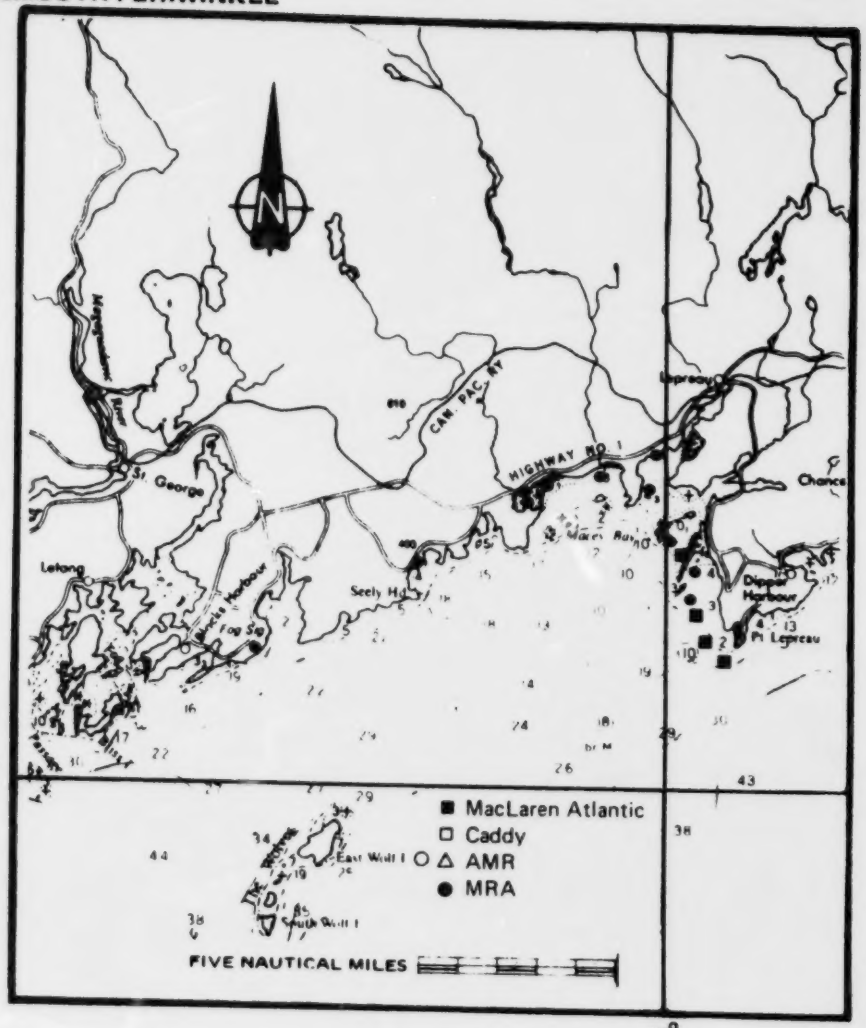
7.10.3
DISTRIBUTION OF THE COMMON PERIWINKLE

PEA POINT TO POINT LEPREAU



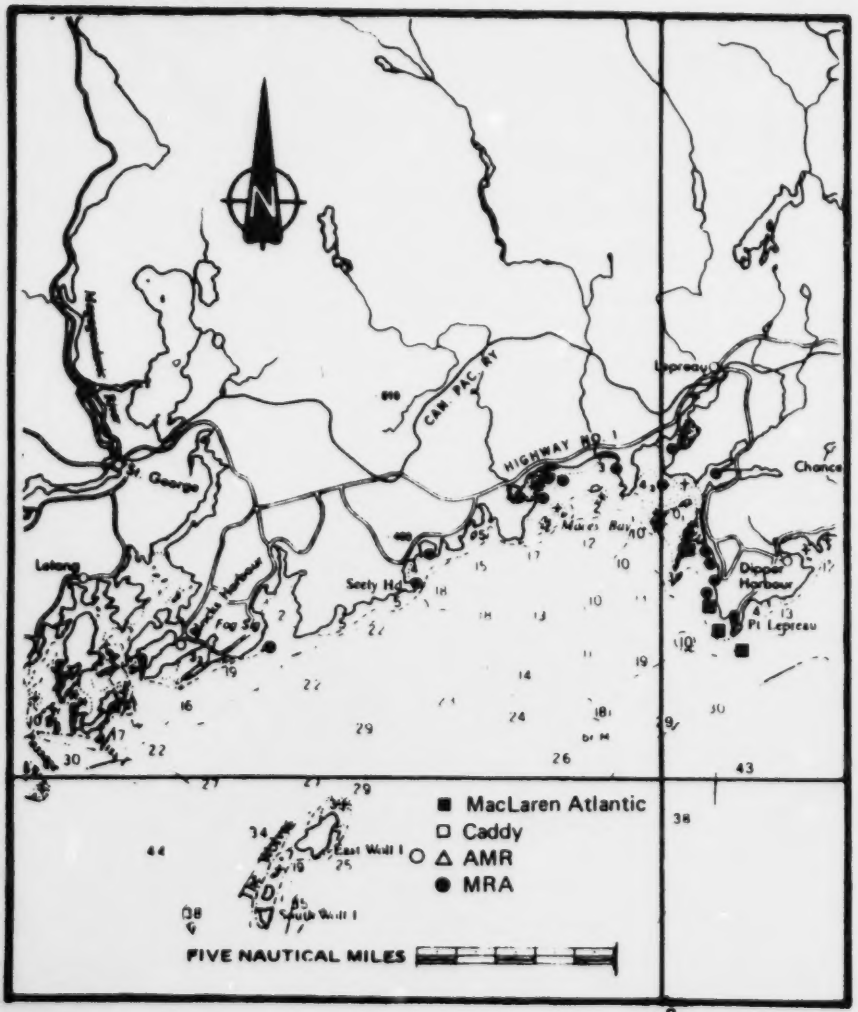
7.10.4
DISTRIBUTION OF THE SMOOTH PERIWINKLE

PEA POINT TO POINT LEPREAU



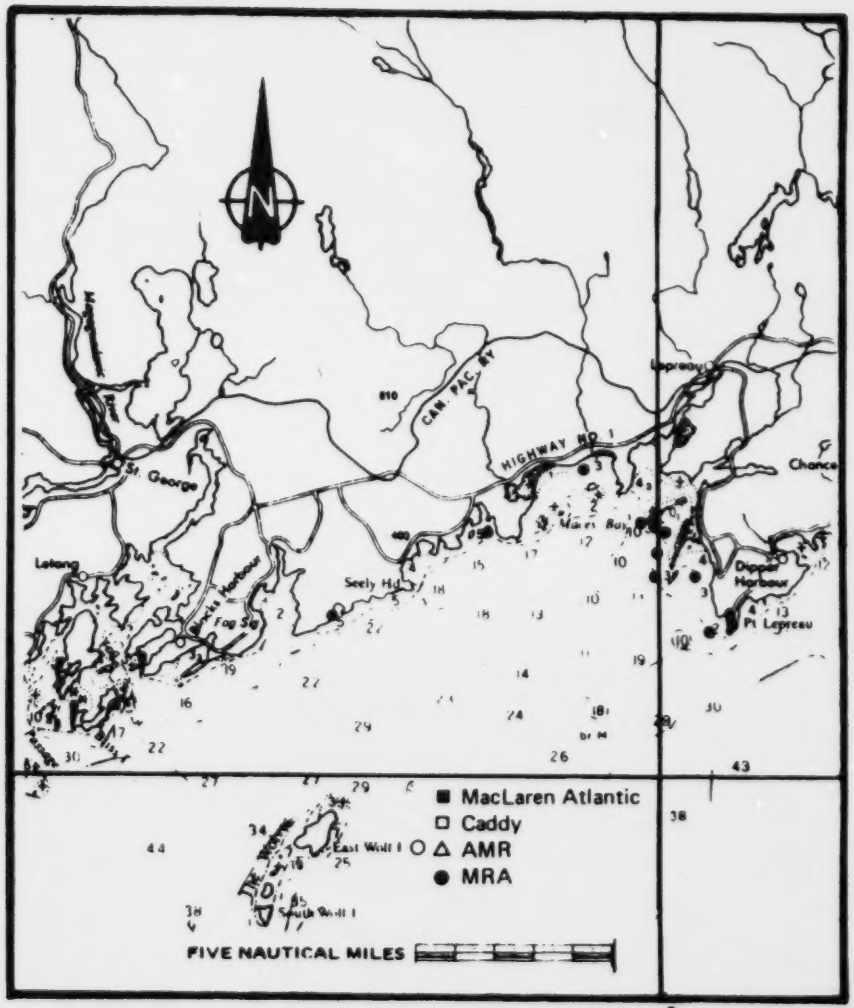
7.10.5
DISTRIBUTION OF THE ROUGH PERIWINKLE

PEA POINT TO POINT LEPREAU



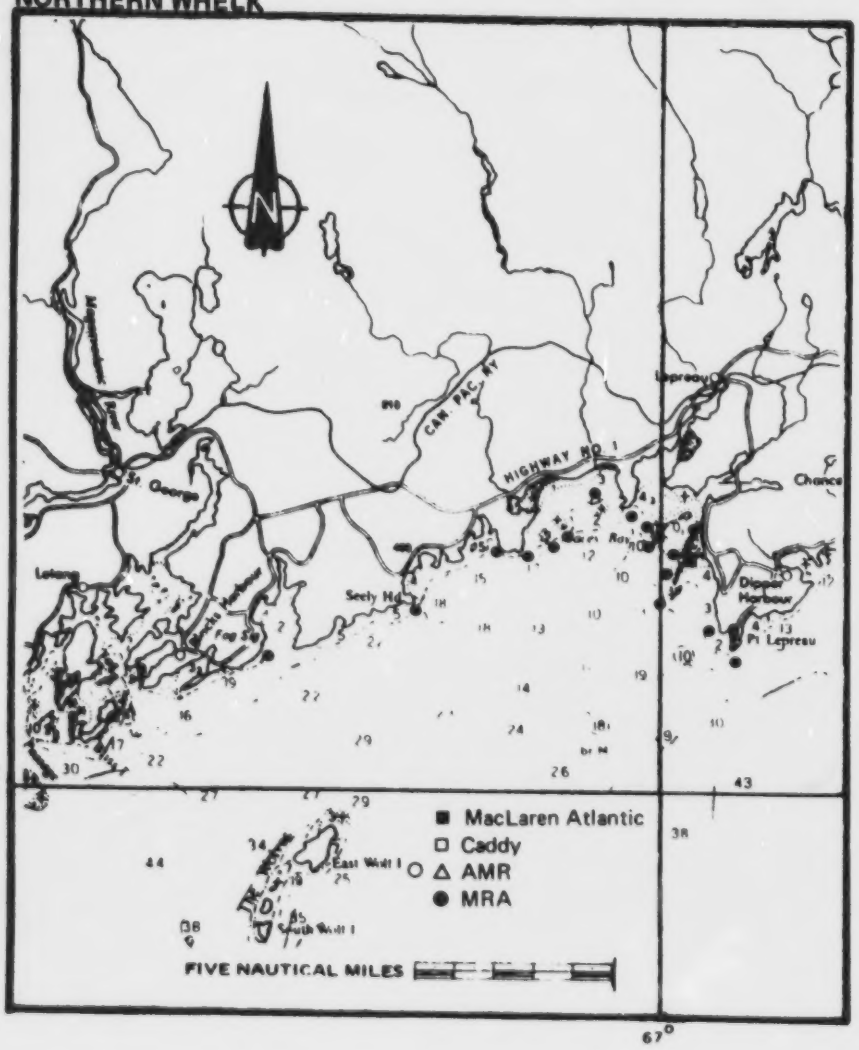
7.10.6
DISTRIBUTION OF THE TEN-RIDGED WHELK

PEA POINT TO POINT LEPREAU



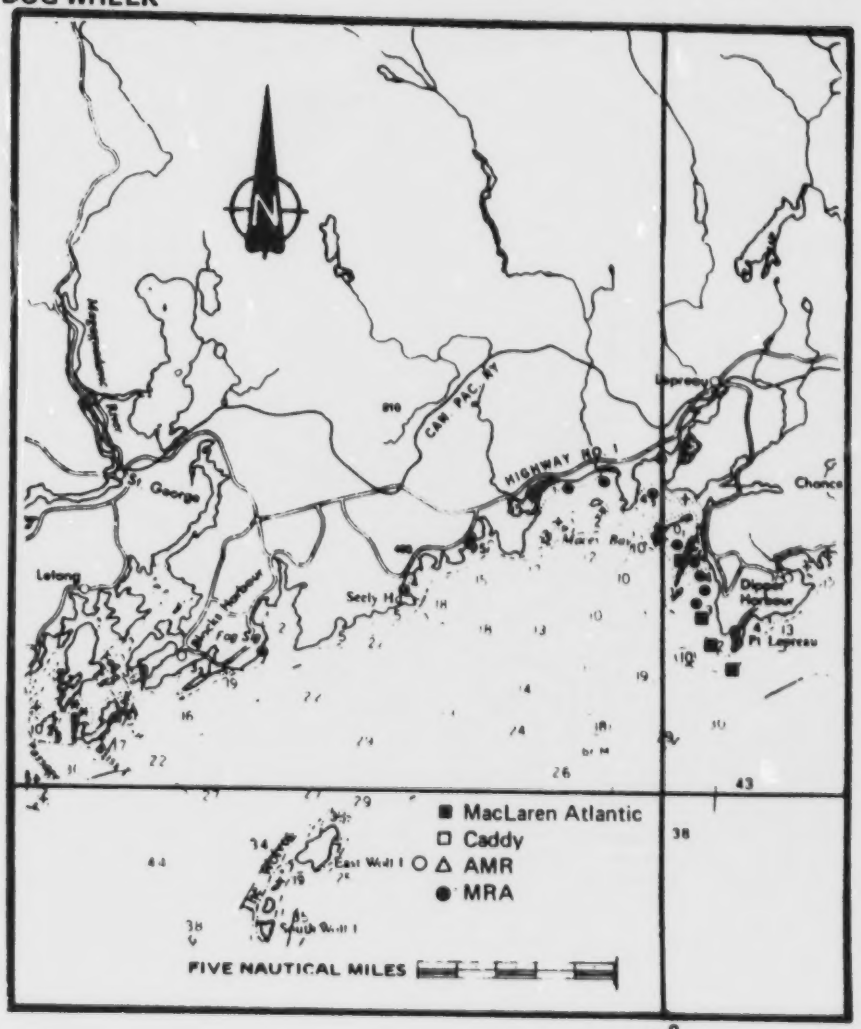
7.10.7
DISTRIBUTION OF THE NORTHERN WHELK

PEA POINT TO POINT LEPREAU



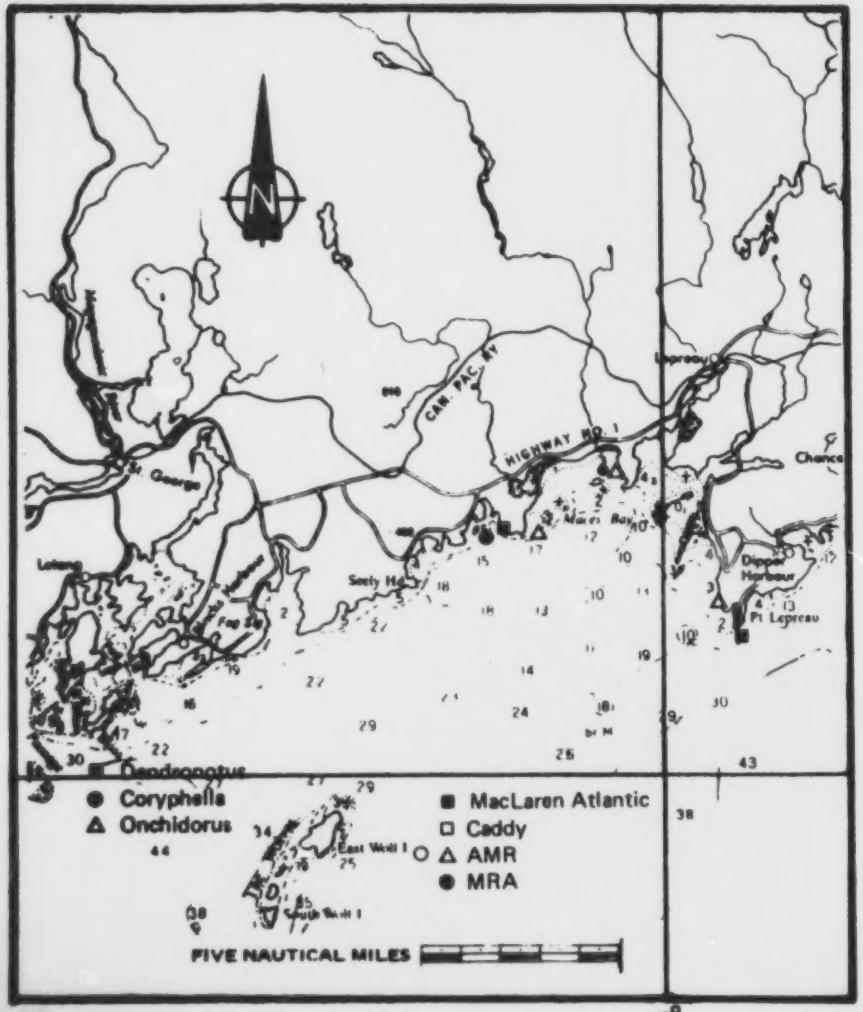
7.10.8
DISTRIBUTION OF THE DOG WHELK

PEA POINT TO POINT LEPREAU



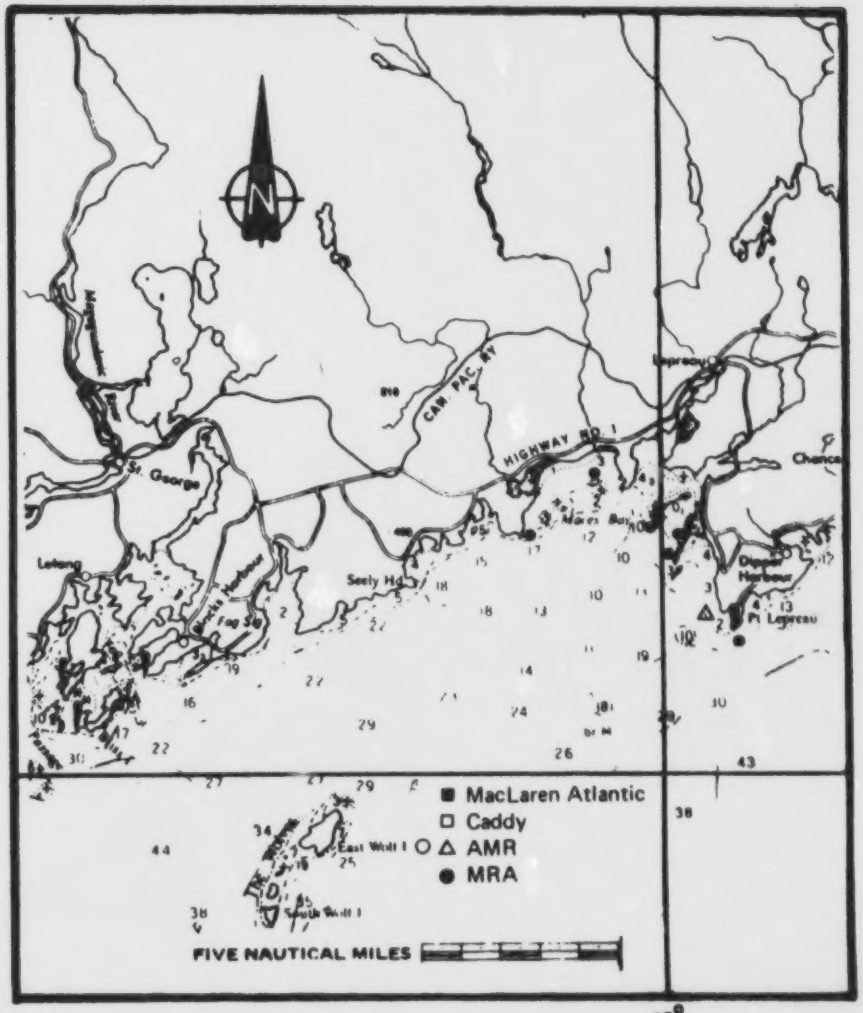
7.10.9
DISTRIBUTION OF NUDIBRANCHS

PEA POINT TO POINT LEPREAU



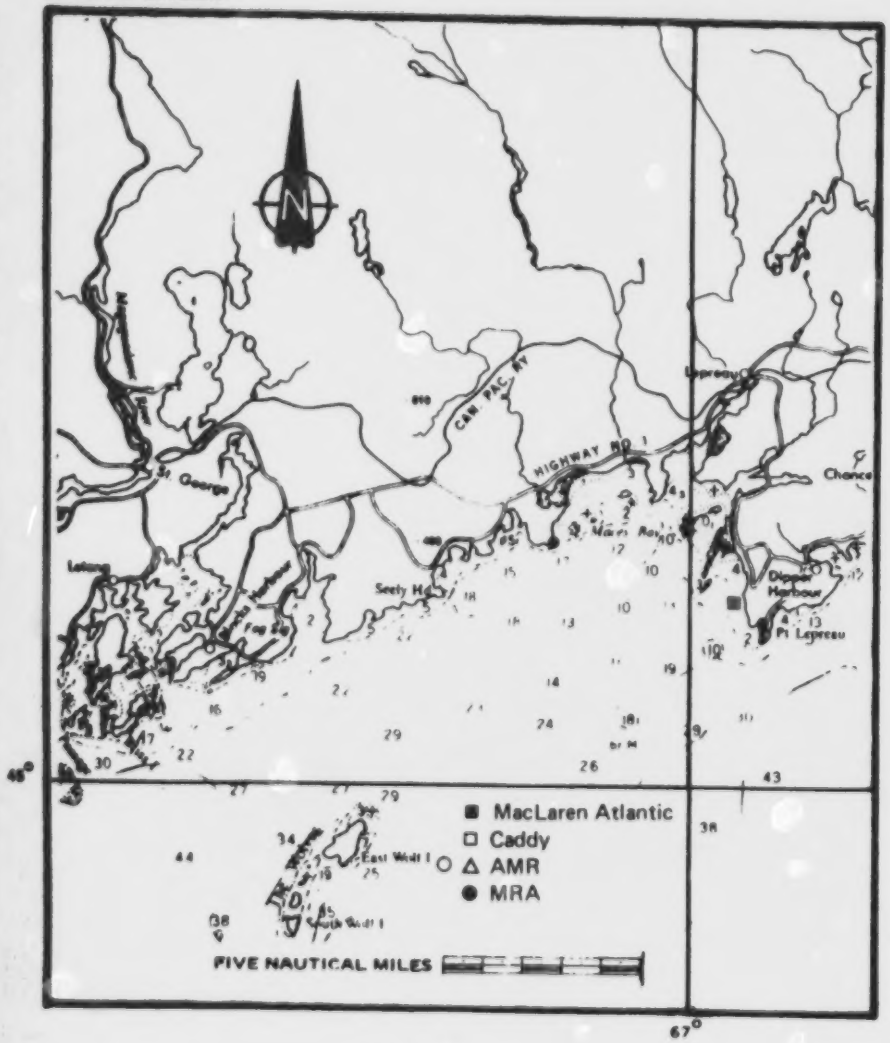
7.10.10
DISTRIBUTION OF GIANT SEA SCALLOP

PEA POINT TO POINT LEPREAU



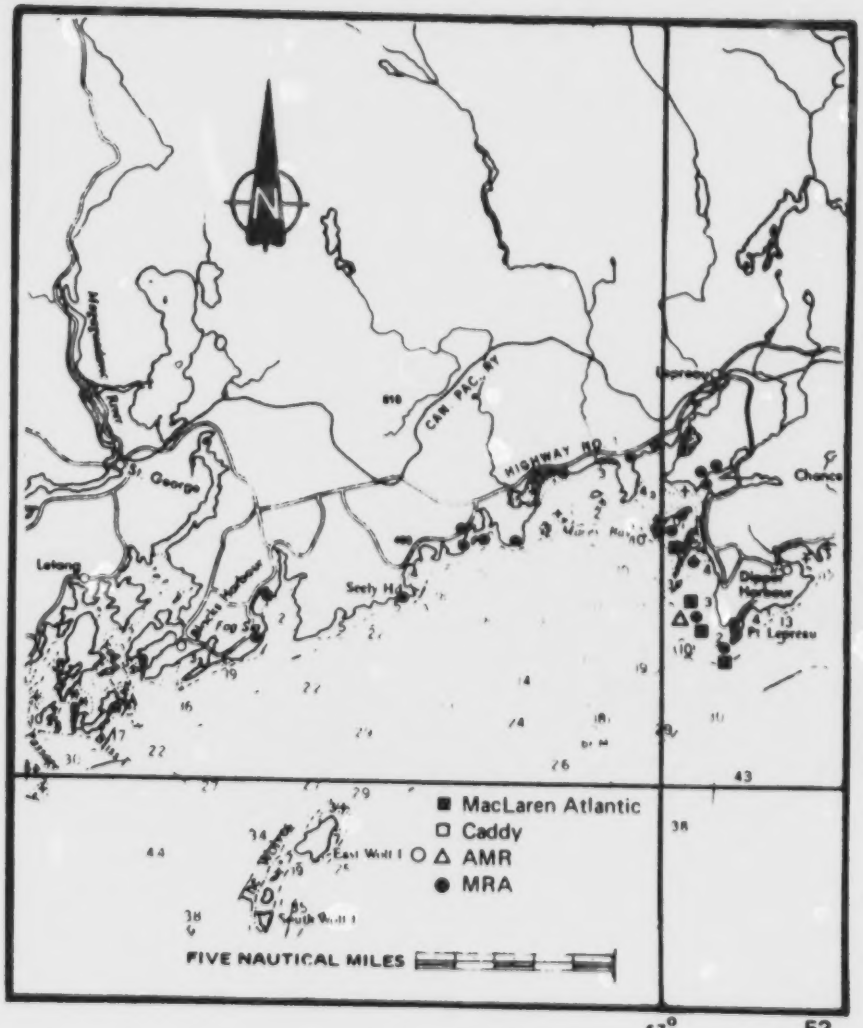
7.10.11
DISTRIBUTION OF THE JINGLE SHELL

PEA POINT TO POINT LEPREAU



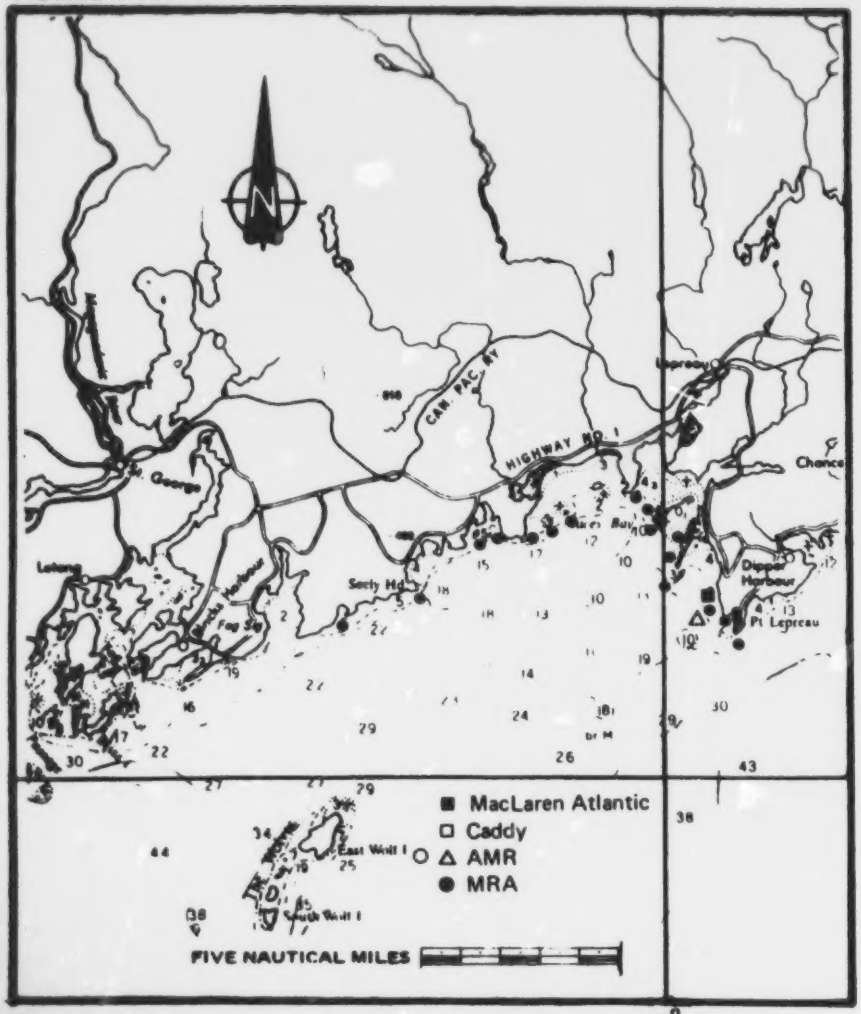
7.10.12
DISTRIBUTION OF THE BLUE MUSSEL

PEA POINT TO POINT LEPREAU



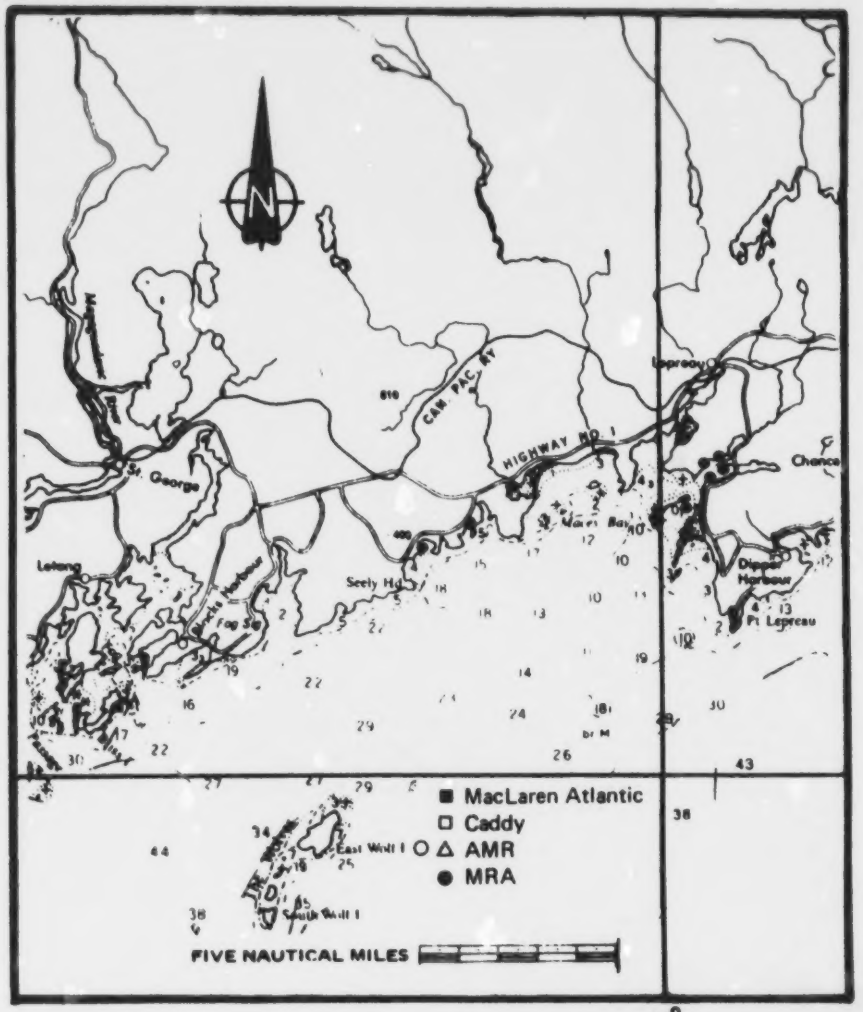
7.10.13
DISTRIBUTION OF THE HORSE MUSSEL

PEA POINT TO POINT LEPREAU



7.10.14
DISTRIBUTION OF THE SOFT-SHELLED CLAM

PEA POINT TO POINT LEPREAU



WORMS

(SEGMENTED, FLAT AND RIBBON WORMS)

7.11 INTRODUCTION

Numerous species of worms occur abundantly in every habitat in the Bay of Fundy. They are particularly common in mud. Consequently, many species in subtidal mud are not likely to be recorded unless mud samples are taken, seived and sorted. Since this was beyond the scope of this survey, it can be expected that other species occur in the study area.

7.12 ANNOTATED LIST OF SPECIES
SEGMENTED WORMS/ANNELIDA

7.12.1 TUBE WORM/*Potamilla reniformis* (Leuckart)

Description - Up to 10 cm long, this worm secretes a tough leathery tube from which its banded tentacles emerge.

Habitat - Occurs subtidally in cracks in ledge and rock.

Distribution and Abundance (Figure 7.12.1) - MacLaren (2-P; Caddy 117-A, 119-C, 120-C). MRA (31-P, 34-P, 35-P, 36-A, 37-A, 38-P).

7.12.2 COILED TUBE WORM/*Spirorbis borealis* Daudin

Description - This tiny (2-3 mm) worm lives in a small pasty-white coiled tube.

Habitat - Occurs intertidally and subtidally on rocks and algae. Often extremely abundant.

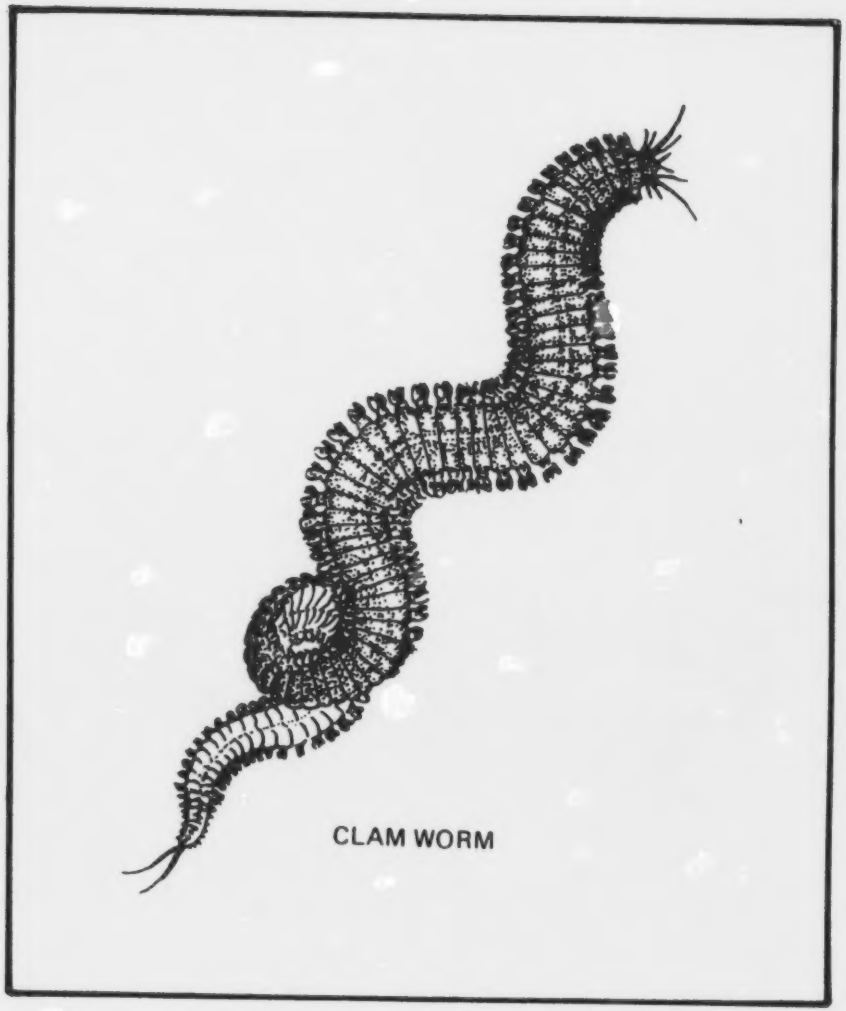
(Figure 7.12.2) - MRA (T5-A, 15-C, 27-P, 28-C, 40-C); Caddy (117-P, 119-P, 120-P).

7.12.3 SCALEWORM/*Lepidonotus squamatus* (Linnaeus)

Description - Up to 5 cm long, scale worms are characterized by two rows of dorsal scales.

Habitat - Occurs intertidally and subtidally under stones and debris.

Distribution and Abundance (Figure 7.12.3) - MRA (8-P, 9-A, 26-P, 35-P, 36-P, 37-P, 38-P).



CLAM WORM

7.12.4 TUBE WORM/*Amphitrite johnstoni* Malmgren

Description - Up to 20 cm long this tube worm lives in tubes constructed from mud.

Habitat - Intertidally in mud, among blue mussels and under rocks, particularly in tide pools. Subtidally occurs in cracks in ledges and rocks and under stones.

Distribution and Abundance (Figure 7.12.4) - 36-P, 37-P.

7.12.5 FEATHERED FAN WORM/*Myxicola infundibulum* (Montagu)

Description - This species reaches 8 cm, contracted length. It is characterized by its gelatinous tube and funnel-shaped brachial crown.

Habitat - Occurs subtidally from low water to 100 feet and more. Most commonly found in cracks in bedrock, under rocks, among Horse Mussels and in loose rock debris.

Commercial Utilization - *M. infundibulum* is an important commercial species used in neurophysiological research. Natural stocks permit some harvesting in the study area.

Distribution and Abundance (Figure 7.12.5) - MRA (1-C, 4-A, 6-P, 9-P, 31-P, 32-P-C, 35-P, 36-A, 37-A, 38-P, 40-P).

7.12.6 LUG WORM/*Arenicola marina* (Linnaeus)

Description - Up to 20 cm long; cylindrical body; grey to grey green

Habitat - Burrows in sandy substrate intertidally and subtidally.

Distribution and Abundance (Figure 7.12.6) - MRA (T5-C, 5-P, 15-C - A); Thomas (23-P).

7.12.7 BAMBOO WORM/*Clymenella torquata* (Malmgren)

Description - A long , cylindrical worm reaching 4 to 5 cm; Reddish; segments widely spaced resembling a piece of bamboo.

Habitat - Occurs intertidally and subtidally and subtidally in sand.

Distribution and Abundance - MRA (25-P); Thomas (27-P).

7.12.8 SHIMMY WORM/*Nepthys incisa* Malmgren

Description - Up to 15 cm; an active segmented worm; characteristically everts its proboscis when disturbed.

Habitat - Occurs abundantly in intertidal and subtidal mud.

Distribution and Abundance - (Figure 7.12.7) - MRA (T3-P, T5-P) Thomas (10-P, 11-P, 23-P, 24-P, 27-P, 26-P, 28-P, 30-P).

7.12.9 CLAM WORM/*Nereis virens* Sars

Description - A large segmented worm reaching 40 cm and more; highly segment brownish; red and green.

Habitat - Intertidally and subtidally in mud.

Distribution and Abundance - (Figure 7.12.8) - MRA (T3-P, 12-P, 15-P, 19-P, 22-P, 28-P); Thomas (10-P, 23-P, 24-P, 25-P, 28-P, 30-P).

7.12.10 ANNELID/*Polycirrus eximius*

Description - A bright red annelid with numerous tentacles; up to 4 cm.

Habitat - Occurs intertidally and subtidally in mud.

Distribution and Abundance - MRA (T3-P, 24-C); Thomas (24-P, 30-P).

FLATWORMS/PLATYHELMINTHES

7.12.11 FLATWORM/*Notoplana atomata* (Muller)

Description - A large (20 mm) elongated oval flatworm; brownish.

Habitat - Intertidally under stones and in tide pools.

Distribution and Abundance - (Figure 7.12.9) - MRA (T1-P, T5-P, 28-P).

7.12.12 FLATWORM/*Procerodes littoralis* (Strom)

Description - A small (8 mm) elongate flatworm; highly active, two antennae; brown, brownish-black.

Habitat - Intertidally in freshwater outflows.

Distribution and Abundance(Figure 7.12.10) - MRA (T2-P, 11-P, 13-C, 14-C, 21-P, 27-A).

RIBBON WORMS/NEMERTEA

7.12.13 RIBBON WORM/*Lineus sp.*

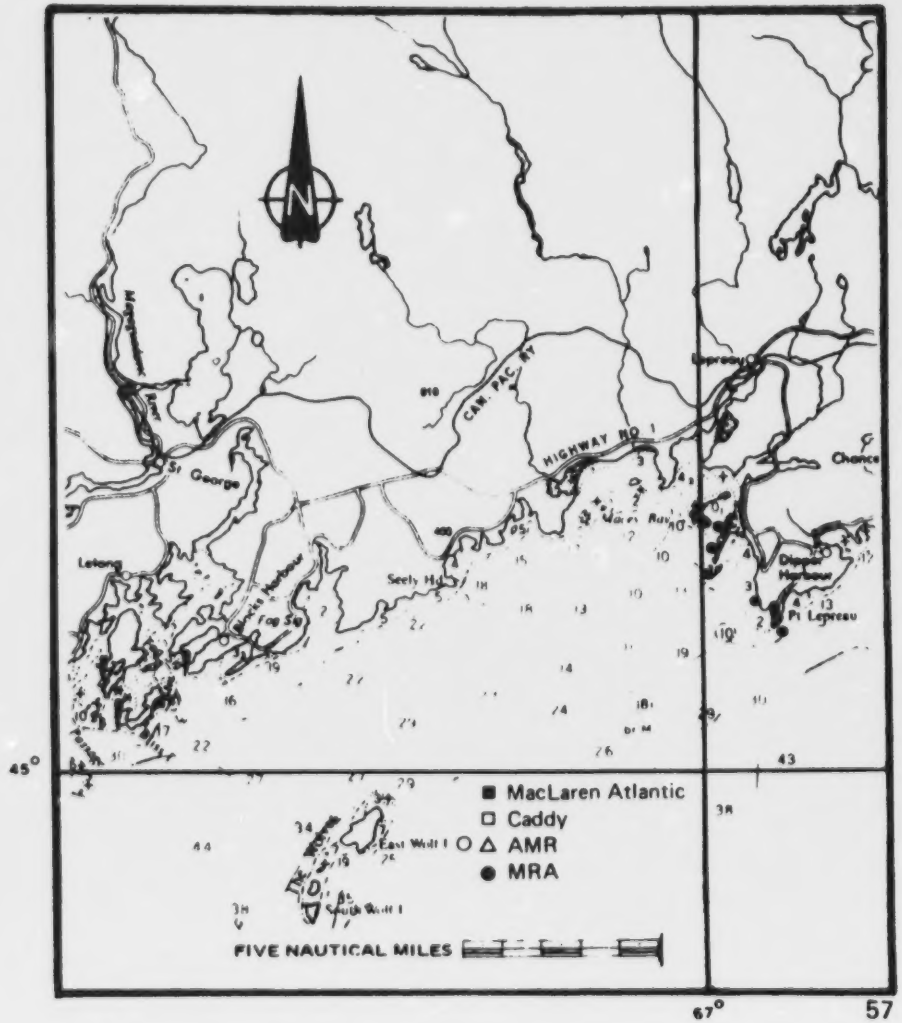
Description - A long (150 mm) slender worm; color varies from red to black and brown.

Habitat - Occurs abundantly in masses under stones. Usually associated with mud.

Distribution and abundance - (Figure 7.12.11) - MRA (T1-P, T2-P, T3-P, T5-P, 16-P, 19-P, 28-P, 29-P).

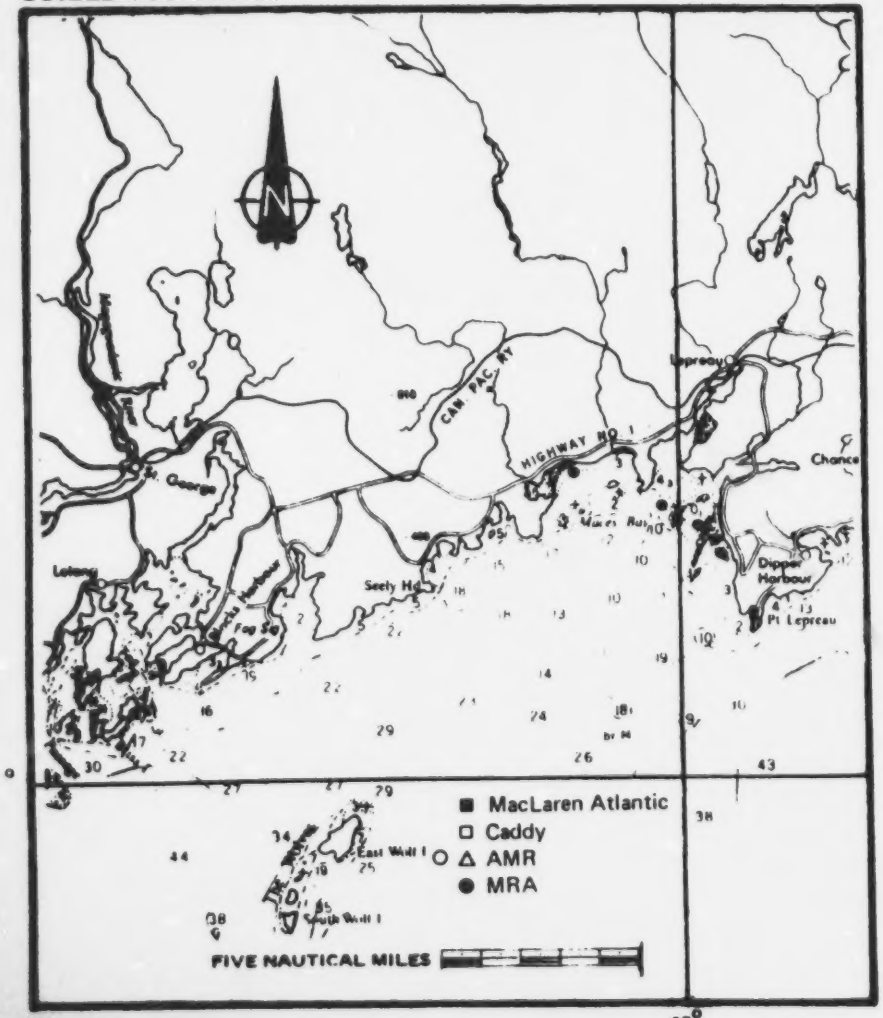
7.12.1
DISTRIBUTION OF TUBEWORM POTAMILLA

PEA POINT TO POINT LEPREAU



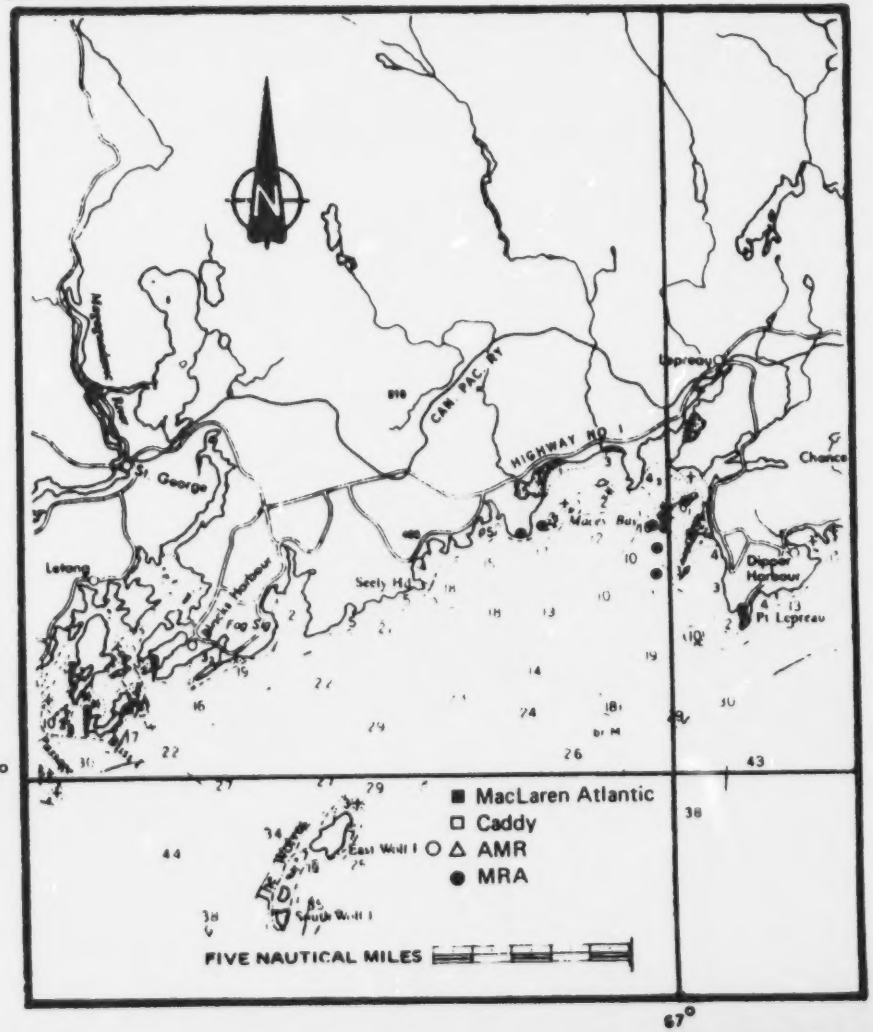
7.12.2
DISTRIBUTION OF
COILED TUBEWORM

PEA POINT TO POINT LEPREAU



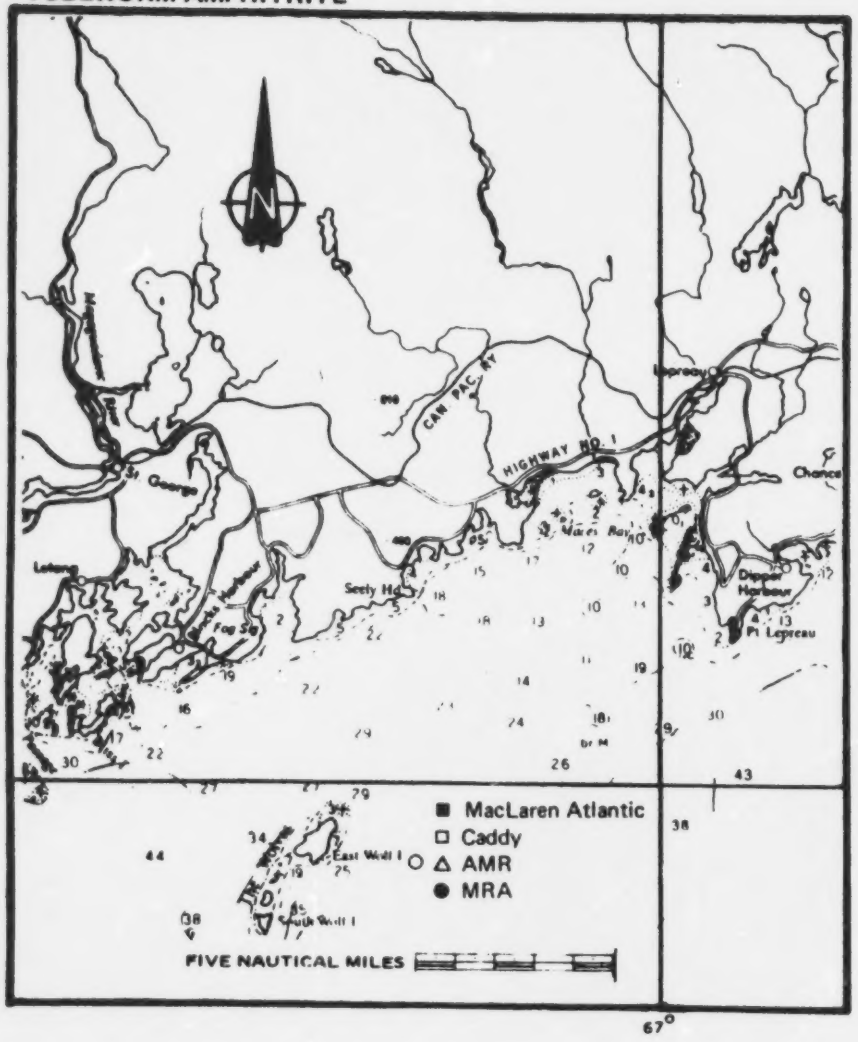
7.12.3
DISTRIBUTION OF
SCALEWORM

PEA POINT TO POINT LEPREAU



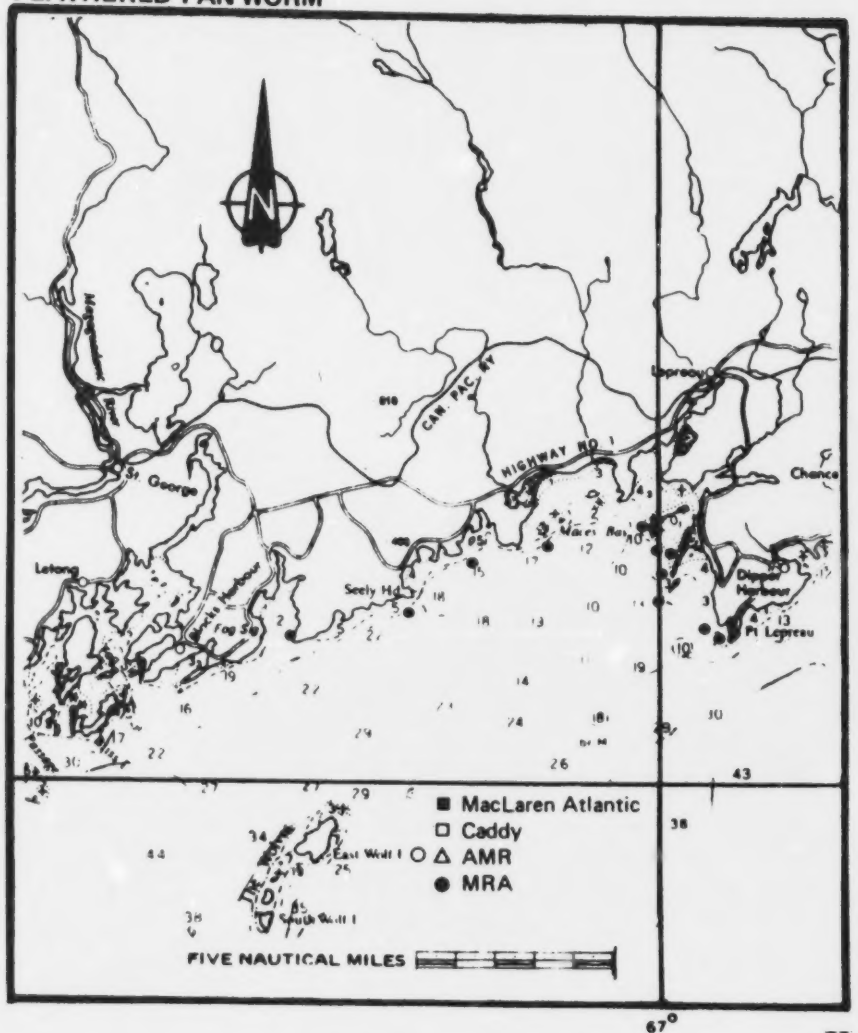
7.12.4
DISTRIBUTION OF TUBEWORM AMPHITRITE

PEA POINT TO POINT LEPREAU



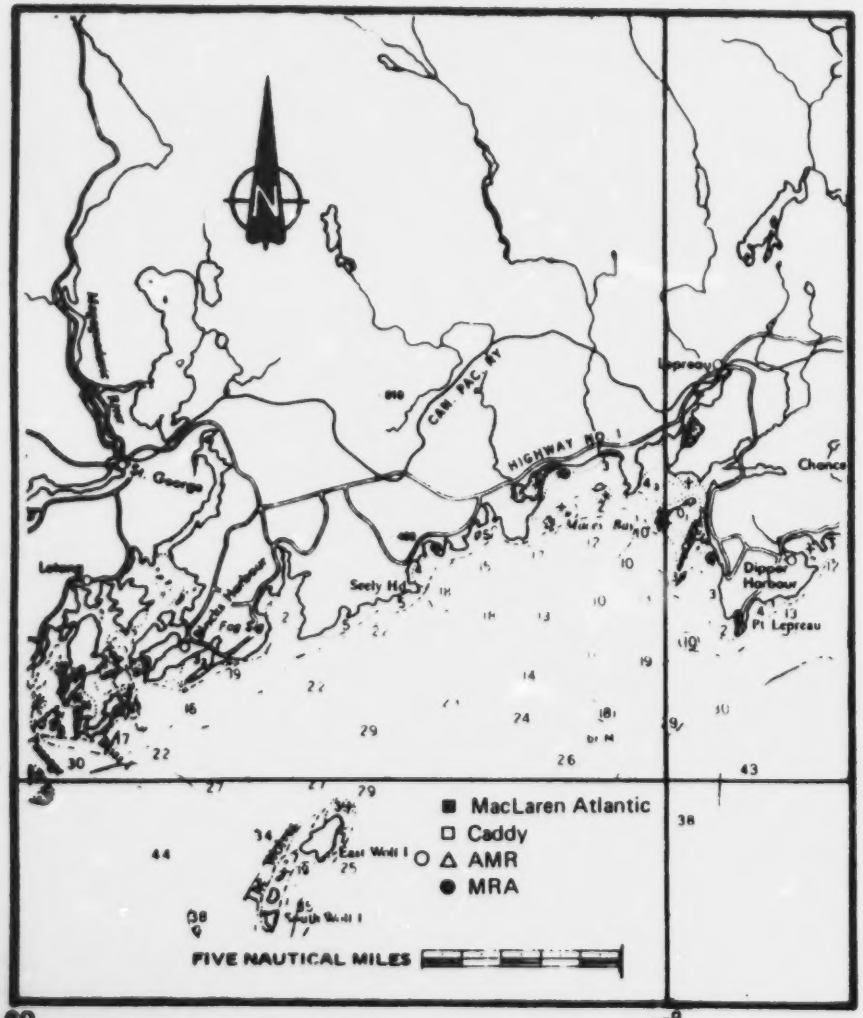
7.12.5
DISTRIBUTION OF FEATHERED FAN WORM

PEA POINT TO POINT LEPREAU



7.12.6
DISTRIBUTION OF LUGWORMS

PEA POINT TO POINT LEPREAU

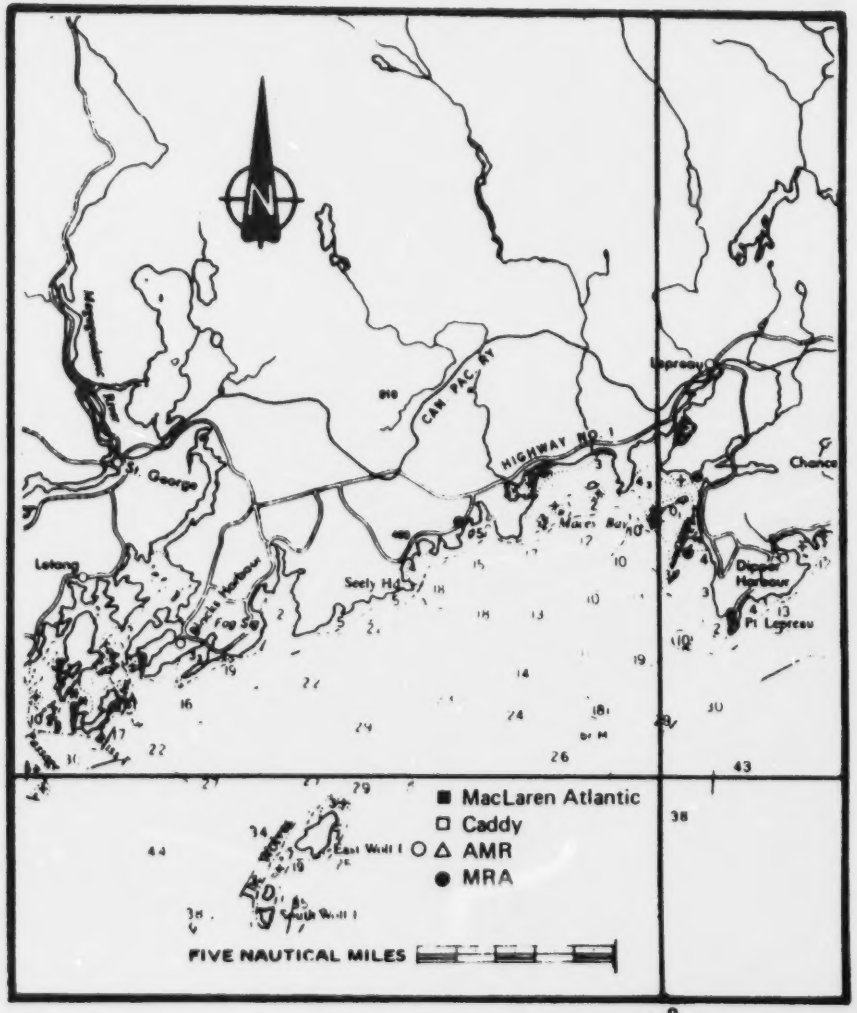


60

67°

7.12.7
DISTRIBUTION OF SHIMMY WORMS

PEA POINT TO POINT LEPREAU

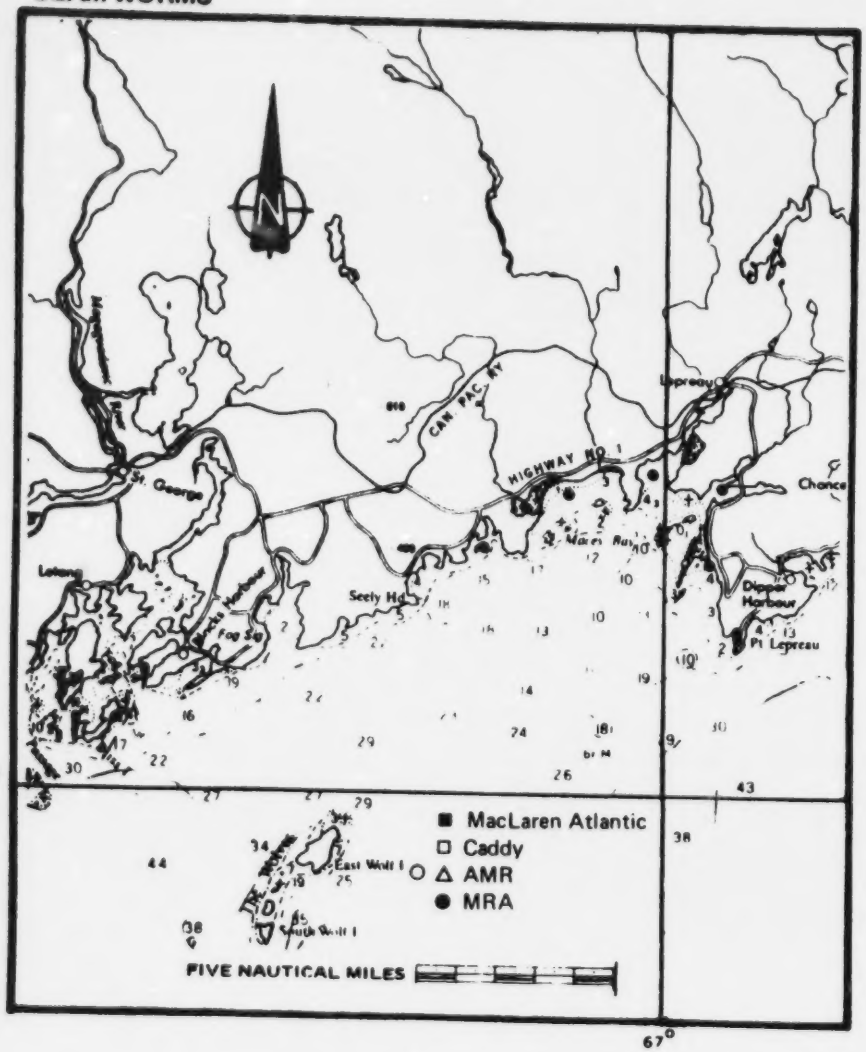


45°

67°

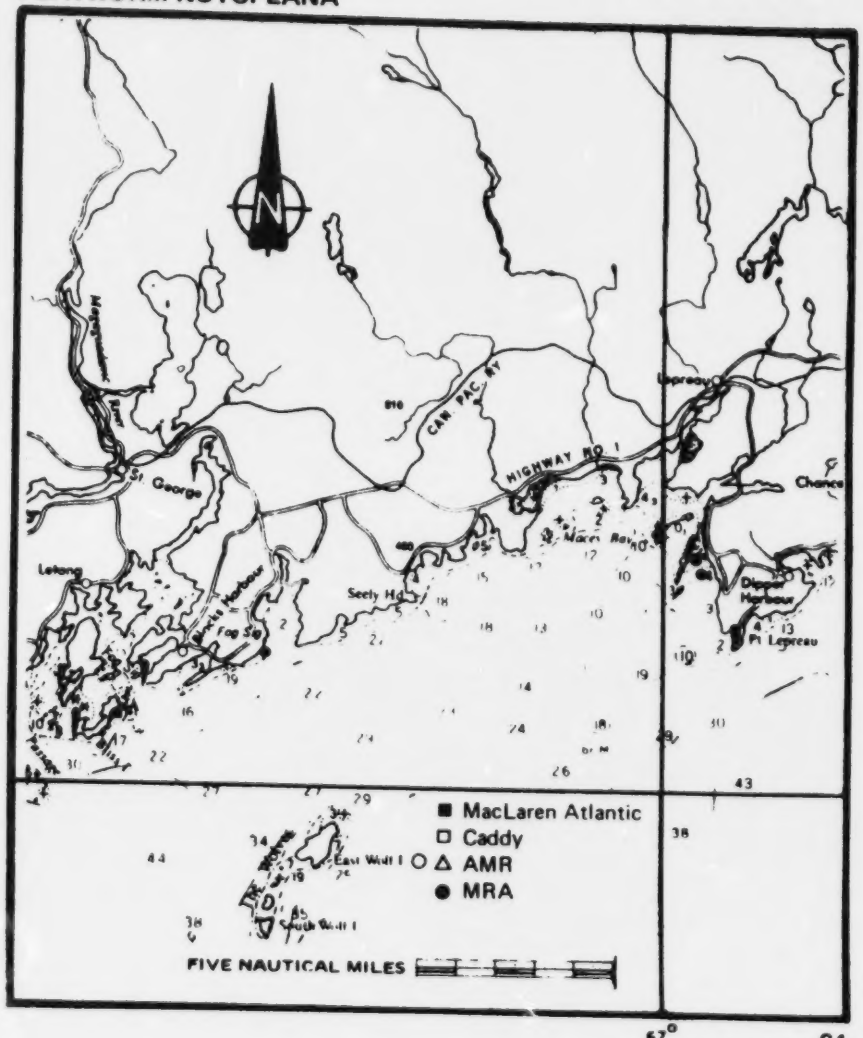
7.12.8
DISTRIBUTION OF CLAM WORMS

PEA POINT TO POINT LEPREAU



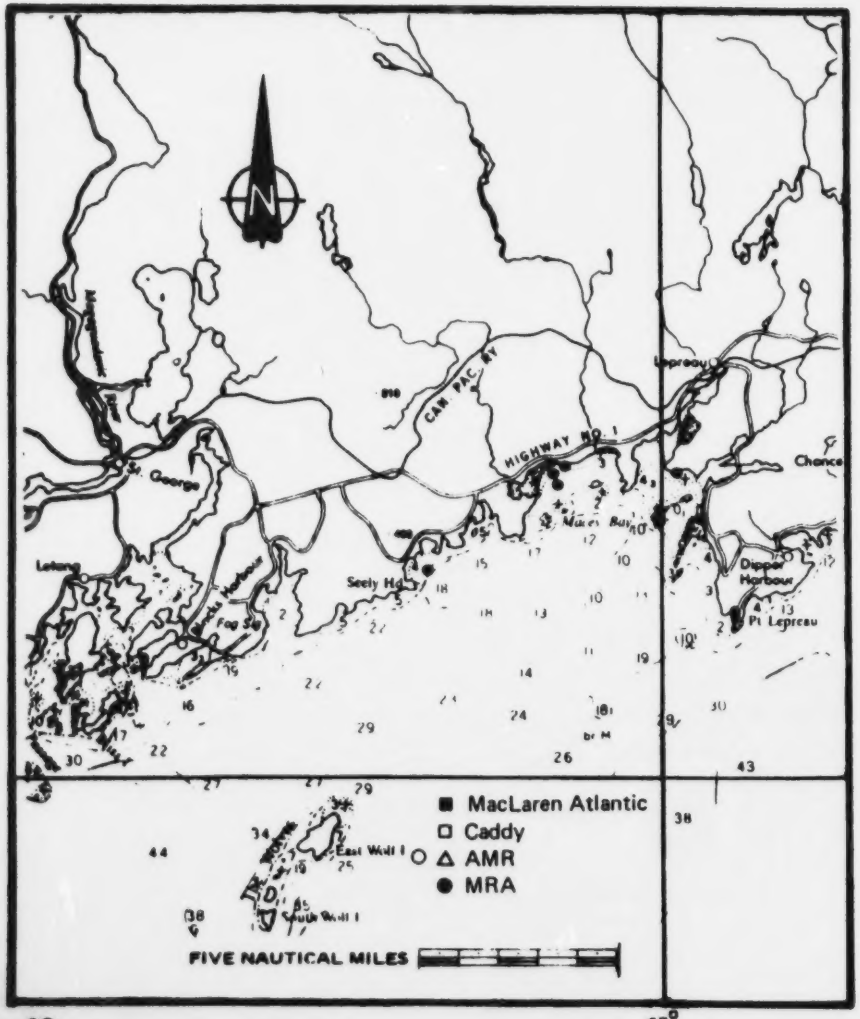
7.12.9
DISTRIBUTION OF FLATWORM NOTOPLANA

PEA POINT TO POINT LEPREAU



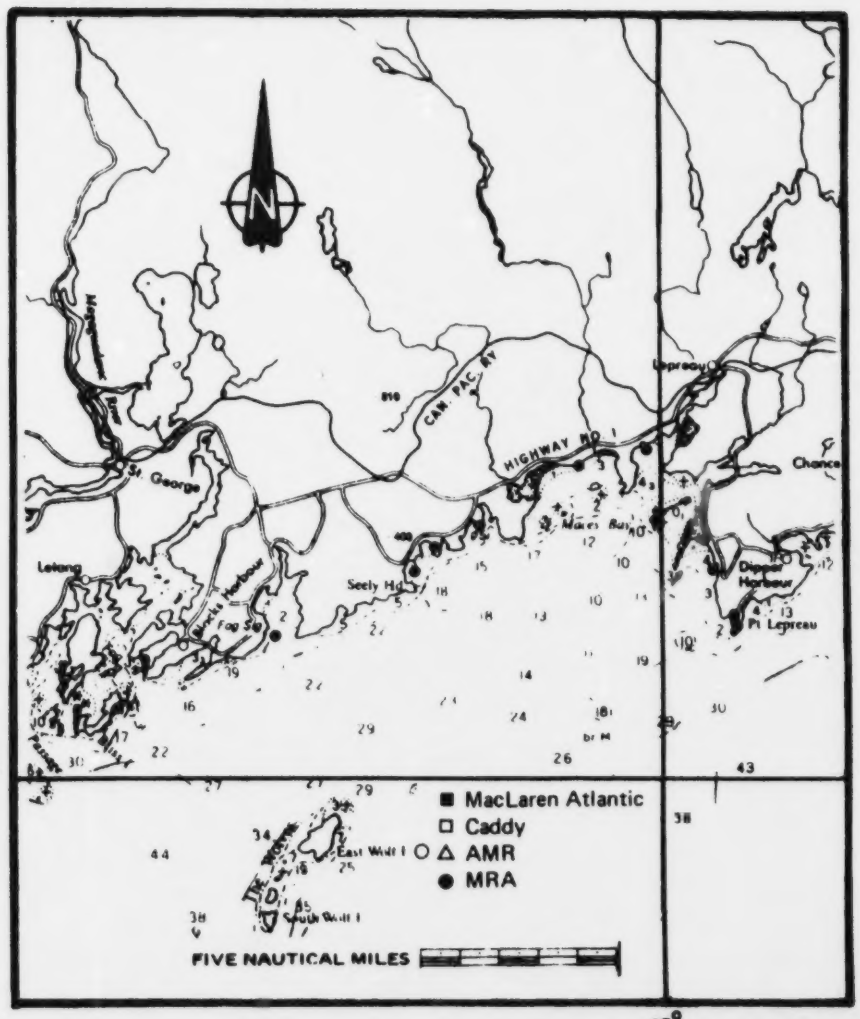
7.12.10
DISTRIBUTON OF
FLATWORM PROCERODES

PEA POINT TO POINT LEPREAU



7.12.11
DISTRIBUTION OF
RIBBON WORM LINEUS

PEA POINT TO POINT LEPREAU



ARTHROPODA
(CRABS, LOBSTER, SHRIMP, ETC.)

7.13 INTRODUCTION

Shrimps, crabs, barnacles, amphipods, lobster and other arthropods form one of the dominant groups in the Bay of Fundy. They are found on all substrates intertidally to high water and subtidally to great depths. All major species are well represented in the study area.

Lobster and shrimp are important commercial species and the Rock Crab, which has potential for commercial utilization, is abundant in the study area.

7.14 ANNOTATED LIST OF SPECIES

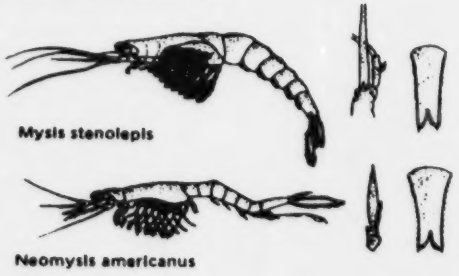
7.14.1 SHRIMP/*Spirontocaris sp.*

Description - Large teeth on back of carapace; to 2½ inches; color-varies; most commonly shades of brown and white.

Habitat - Occurs subtidally, from low water to depths in excess of 100 feet. Commonly found living in kelp beds.

Distribution and Abundance - MRA (32-P). T2-C.

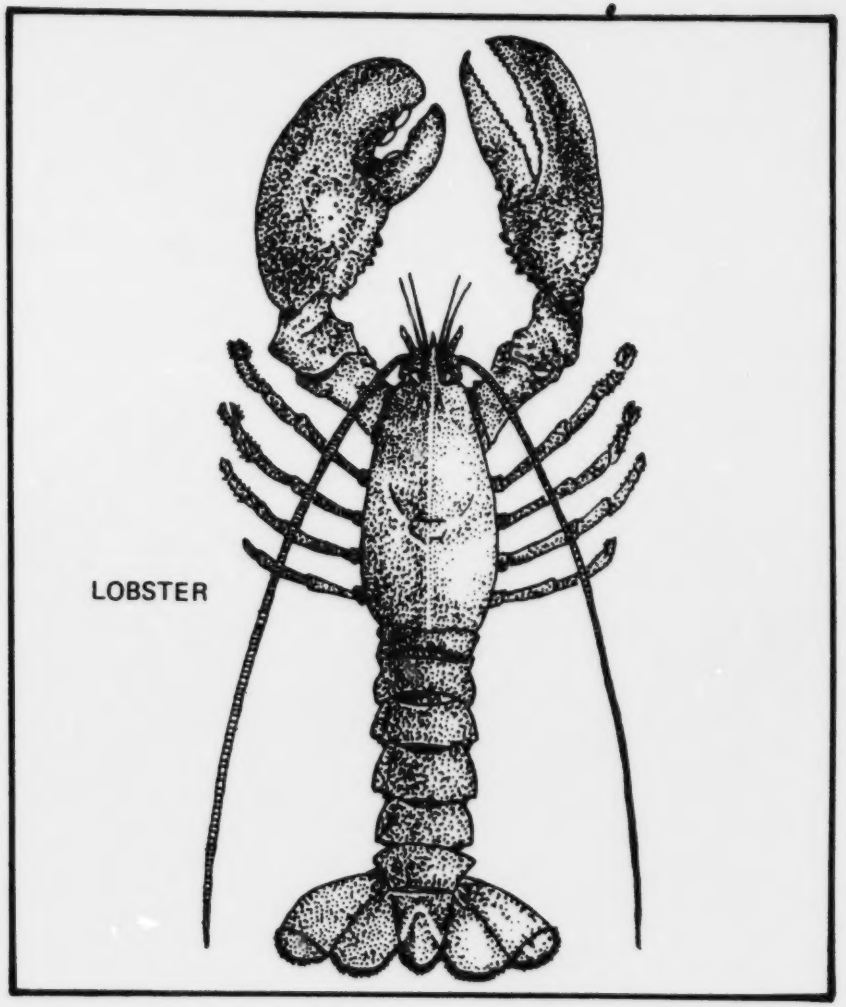
7.14.2 FAIRY SHRIMP/*Mysis sp.*



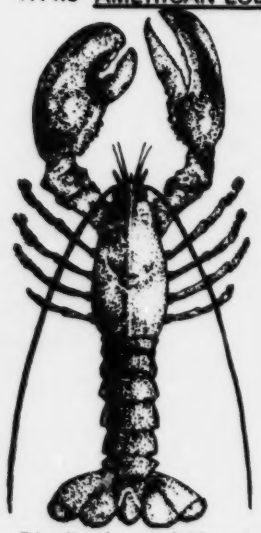
Description - To 1¼ inches; transparent with prominent black eyes.

Habitat - Occurs intertidally in ponds and tide pools. Commonly found just below low tide in summer. It appears to drop to lower depths during winter months. Normally swims just above the bottom; most commonly on mud or sand substrates.

Distribution and Abundance - MRA (T4-P-C, 18-P).



7.14.3 AMERICAN LOBSTER/*Homarus americanus* (Milne · Edwards)



Description · Average size for market-10 inches and 1 to 2 pounds but recorded to 34 inches; dark green above, yellow, orange, red, below.

Habitat · Occurs subtidally from low water to depths in excess of 100 feet on a variety of substrates. Usually observed in burrows under rocks or holes in ledges during late summer and fall.

Commercial Utilization · A good commerfishery exists for this species in the study area. See section 9 for additional details.

Distribution and Abundance · (Figure 7.14.1) · MRA (2-P, 6-P, 8-P, 9-P, 18-P, 31-P, 33-P, 34-P, 35-P, 36-C-A, 37-C-A, 39-C-A).

7.14.4 COMMON BARNACLE/*Balanus balanoides* (Linnaeus)

Description · less than ½ inch; white.

Habitat · Occurs intertidally on rocks, wharves and pilings. Most common near the middle of tidal zone to high water.

Distribution and Abundance · (Figure 7.14.2) · MRA (T1-P-A, T2-P-A, T5-P, 1-P, 4-A, 8-A, 11-C, 12-P, 13-C, 15-P-C, 16-P-C, 17-C-A, 19-C-A, 20-C, 21-C, 25-C, 26-P-C, 27-C, 28-P-C, 29-P-A, 30-P-C); AMR (1-P, 2-P); MacLaren (1-P, 2-P, 3-P, 4-P, 5-P, 6-P, 7-P, 8-P, 9-P); Thomas (2-P, 5-P).

7.14.5 BARNACLE/*Balanus balanus*

Description · A large barnacle reaching 5 cm.

Habitat · Usually found subtidally under rocks and on Horse mussel and scallop shells.

Distribution and Abundance·(Figure 7.14.3) · MRA (8-C, 9-C, 10-P, 32-P, 35-P, 36-P, 37-P, 39-P, 40-P).

7.14.6 CAPRELLIDS/*Caprella sp.*

Description · Slender body; to 1 inch; translucent, reddish, red, or mottled.

Habitat · Occurs subtidally on hydroids, sponges, tunicates, etc. It is particularly abundant on weir twine at times.

Distribution and Abundance · MRA (34-A).

7.14.7 AMPHIPOD/*Corophium vdutator* (Pallas)

Description · Slender body; to ½ inch; translucent brown with some banding.

Habitat · Occurs intertidally in tubes in soft mud.

Distribution and Abundance · MRA (22-C).

7.14.8 BEACH FLEA/*Gammarus oceanicus* Segerstrale

Description · Common beach flea; to 1 inch; Green, brown, various shades.

Habitat · Occurs intertidally on most shores Common under rocks and seaweed.

Distribution and Abundance · (Figure 7.14.4) · MRA (T1-P-C, T2-P-C, T3-P-C, T5-P-A, 5-C-A, 11-C, 12-P, 13-C, 14-P, 15-C, 16-P-C, 17-A, 19-P-C, 20-C, 21-C, 22-P,25-C, 26-P-C, 27-A, 28-C, 29-C-A, 30-A); MacLaren (1-P, 2-P, 3-P, 4-P, 5-P, 6-P, 7-P, 8-P.

7.14.9 BEACH HOPPER/*Orchestia agilis*

Description · Common beach hopper; to 1/8 inch; dark brown, green.

Habitat · Occurs most abundantly under drift weed at high water mark.

Distribution and Abundance · MRA (T5-A).

7.14.10 ISOPOD/*Idotea sp.*

Description - Elongated oval shape, similar to terrestial sowbug; to ¾ inch; various shades of brown and black with banding. Color changes to match habitat.

Habitat - Occurs intertidally in tidepools under rocks, often associated with eel grass and on algae such as *Ascophyllum.*

Distribution and Abundance - MRA (14-P).

7.14.11 ISOPOD/*Limnoria sp.?*

Description - Elongated oval shape; to 1/8 inch; black, brown.

Habitat - Occurs intertidally under rocks, etc. Most abundant in small drainage areas.

Distribution and Abundance - (Figure 7.14.5) - MRA (T2-P, T3-P, T5-P, 5-C, 11-P, 12-P, 13-C, 20-C, 21-C, 22-P-C, 27-C, 28-P-C).

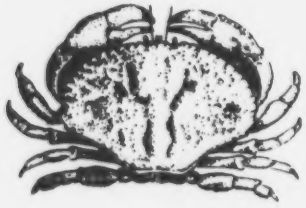
7.14.12 SAND SHRIMP/*Crangon septemspinosus* Say

Description - Common sand shrimp; to 2½ inches; brown or grey with dark spots.

Habitat - Occurs intertidally and subtidally on sand and mud bottoms; present in tidepools.

Distribution and Abundance - MRA (T4-P-C).

7.14.13 ROCK CRAB/*Cancer borealis* (Stimpson)



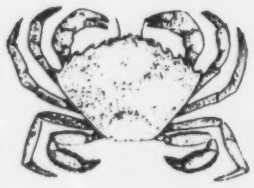
Description - Heavy carapace; to 6 inches; brick red dorsally, white, yellow ventrally.

Habitat - Occurs subtidally on varied substrates from low water to depths in excess of 100 feet. Occasionally found intertidally buried in sand or under rocks.

Commercial Utilization - Good potential exists for a fishery with some markets developing at the present time. See section 9 for further details.

Distribution and Abundance - (Figure 7.14.6) - MRA (T4-P, 3-A, 4-P, 6-A, 7-C, 8-C, 9-P, 10-C, 18-P, 32-P, 33-P, 34-P, 35-P, 36-C, 37-C, 38-P, 39-C, 40-P); Caddy (119-P).

7.14.14 GREEN CRAB/*Carcinus maenas* (Linnaeus)



Description - Light carapace; to 4 inches; dark green dorsally, light green, yellow ventrally.

Habitat - Occurs intertidally under seaweed and rocks from mid littoral to low water. Occurs subtidally around wharves and muddy basins.

Distribution and Abundance - (Figure 7.14.7) - MRA (T2-P-C, T3-P-C, 5-C, 11-P-C, 13-P, 14-P, 15-P, 16-P-C, 17-C, 19-P, 20-P, 21-C, 22-P, 25-C, 27-C, 28-P, 29-P, 30-P).

7.14.15 TOAD CRAB/*Hyas sp.*

Description - To 3 inches in body length; brick red to dirty brown; often decorated with sponges etc.

Habitat - Occurs subtidally from low water to depths in excess of 100 feet on various substrates.

Distribution and Abundance - (Figure 7.14.8) - MRA (4-P, 5-C-A, 8-C, 9-P, 33-P, 36-C, 37-C, 39-C).

7.14.16 HERMIT CRAB/*Pagurus sp.*

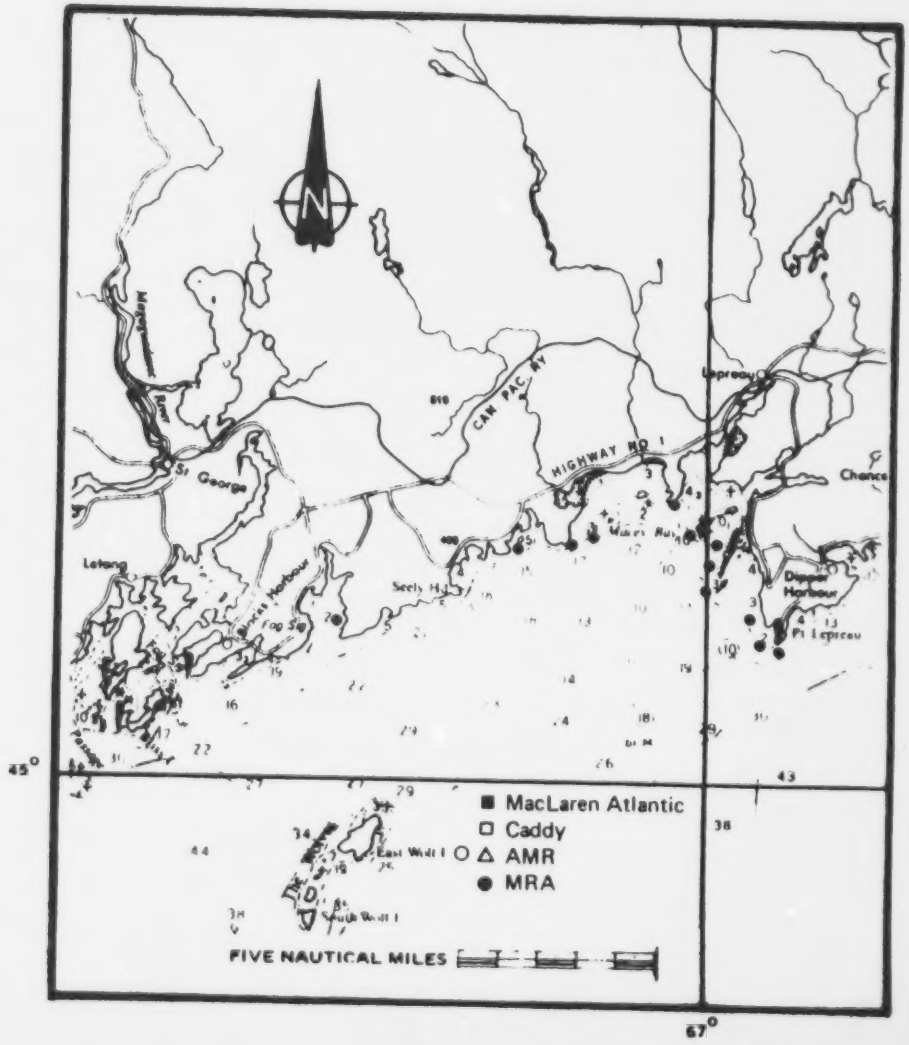
Description - Lives in various empty Gastropod shells; soft-bodied except for legs and claws; usually red with white, some with blue. One common species is covered with brown hairs.

Habitat - Occurs subtidally from low water to depths in excess of 100 feet; on all substrates. Rarely found intertidally in tide pools.

Distribution and Abundance - (Figure 7.14.9) - MRA (T4-C, 1-P, 2-C, 3-C, 4-P, 6-C, 8-C, 9-C, 18-P, 31-P, 33-C, 34-P, 35-P, 36-C-A, 37-C-A, 39-C-A, 40-P); Caddy (117-P, 151-P, 152-P).

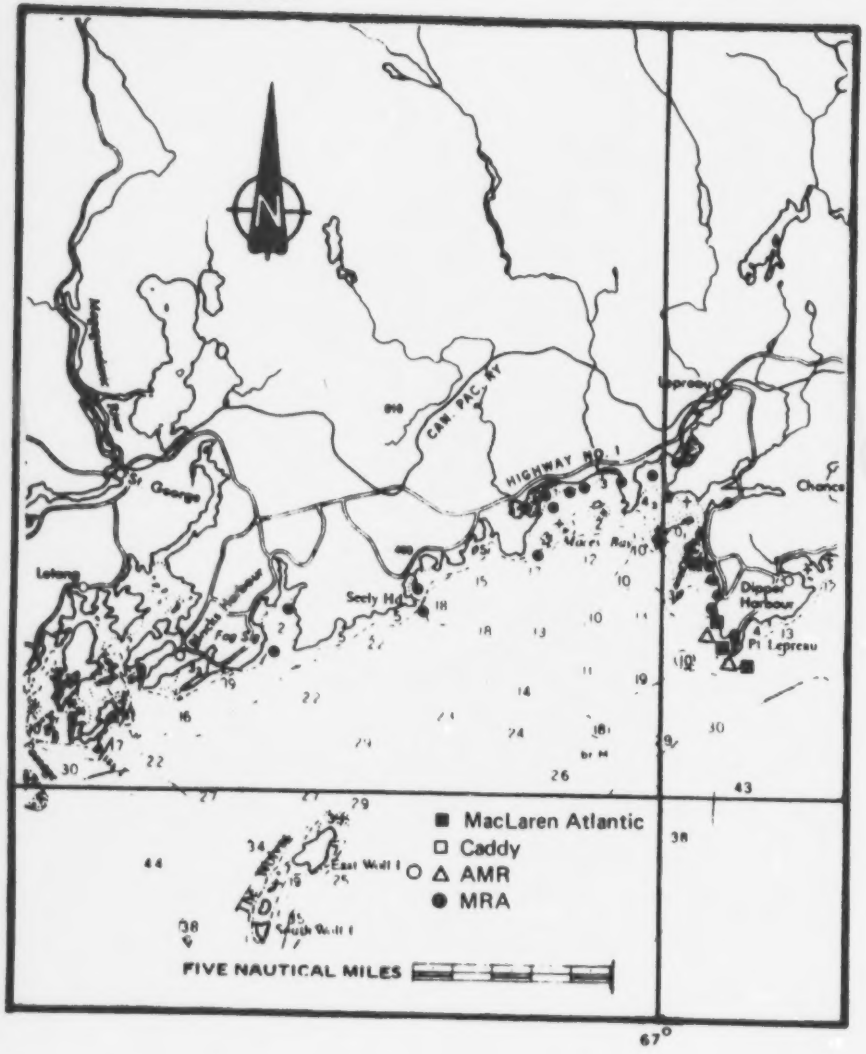
7.14.1
DISTRIBUTION OF LOBSTER

PEA POINT TO POINT LEPREAU



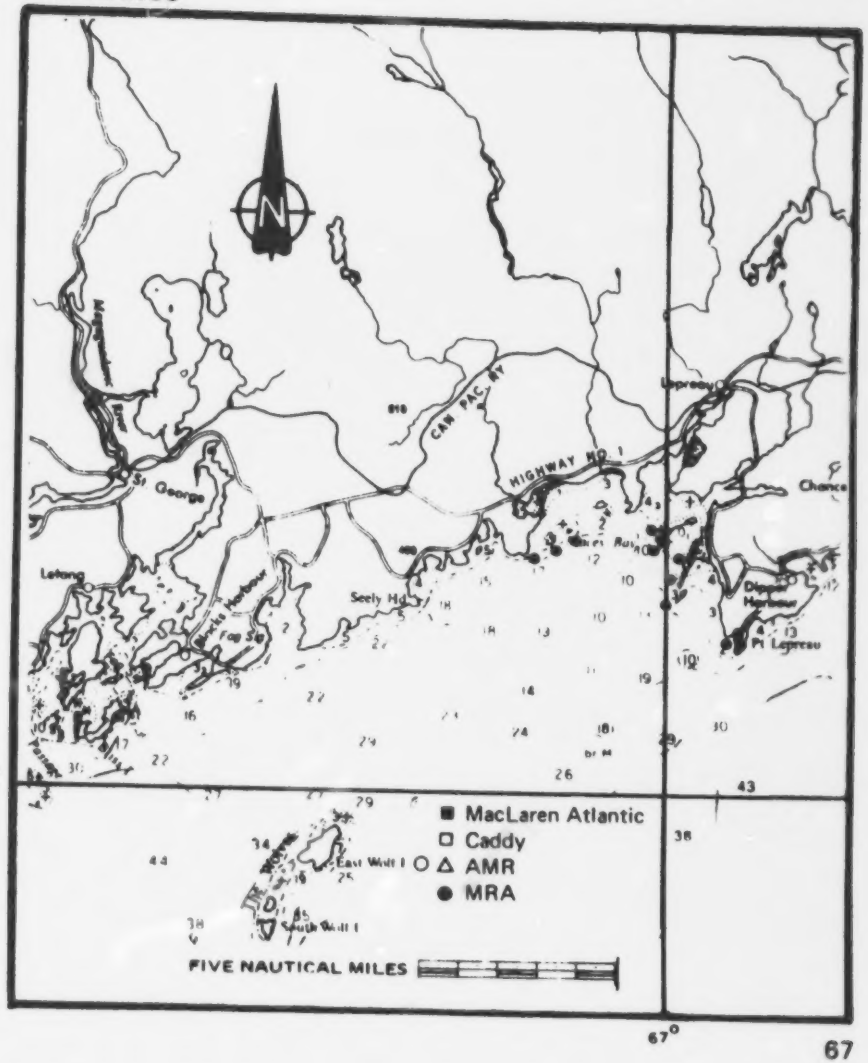
7.14.2
DISTRIBUTION OF COMMON BARNACLE

PEA POINT TO POINT LEPREAU



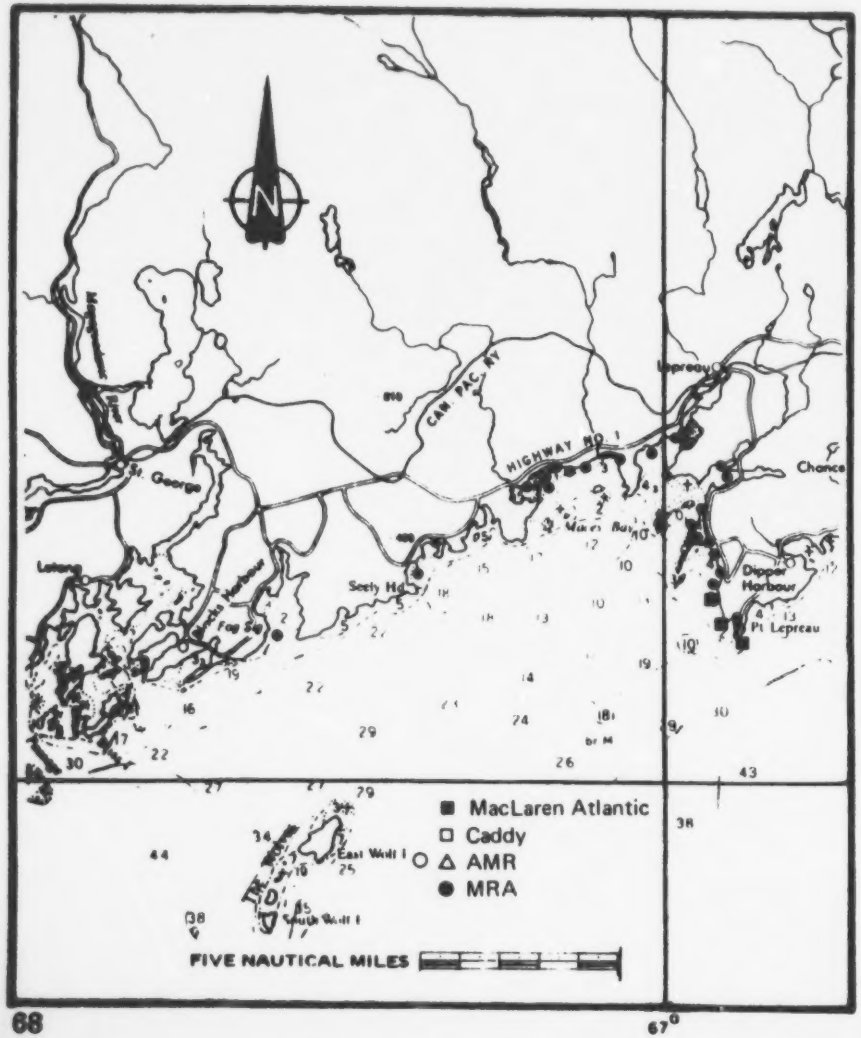
7.14.3
DISTRIBUTION OF THE BARNACLE B. BALANUS

PEA POINT TO POINT LEPREAU



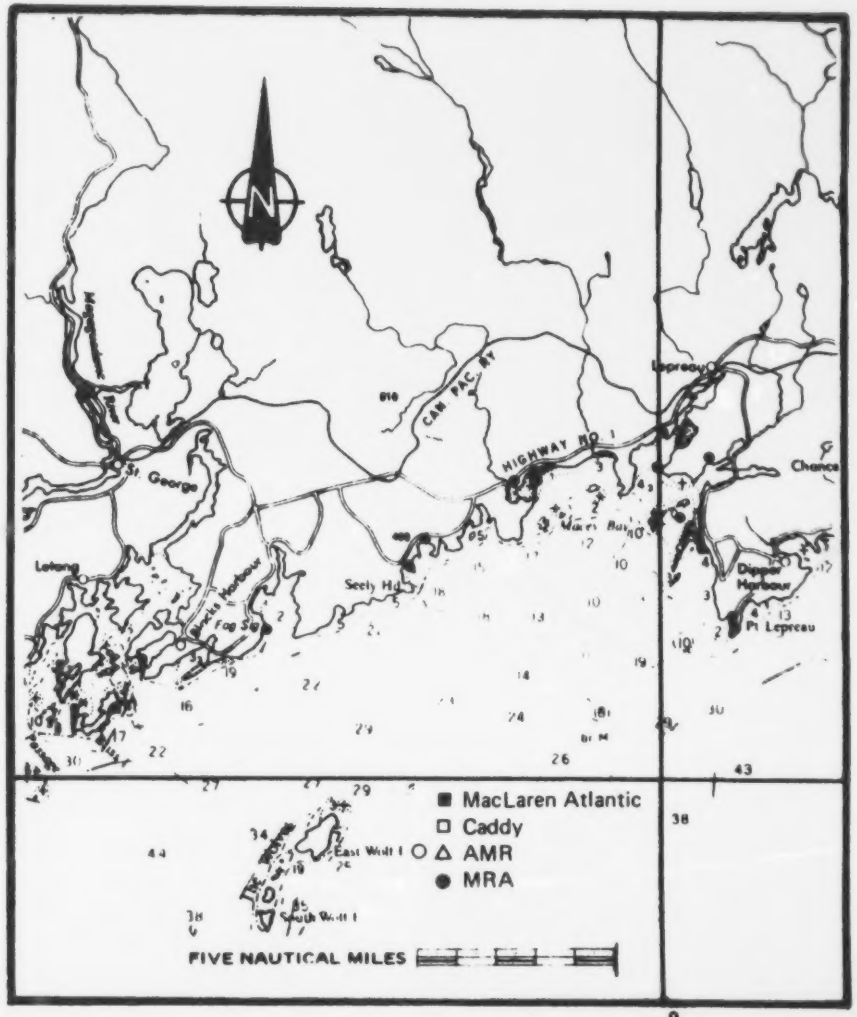
7.14.4
DISTRIBUTION OF THE BEACH FLEA

PEA POINT TO POINT LEPREAU



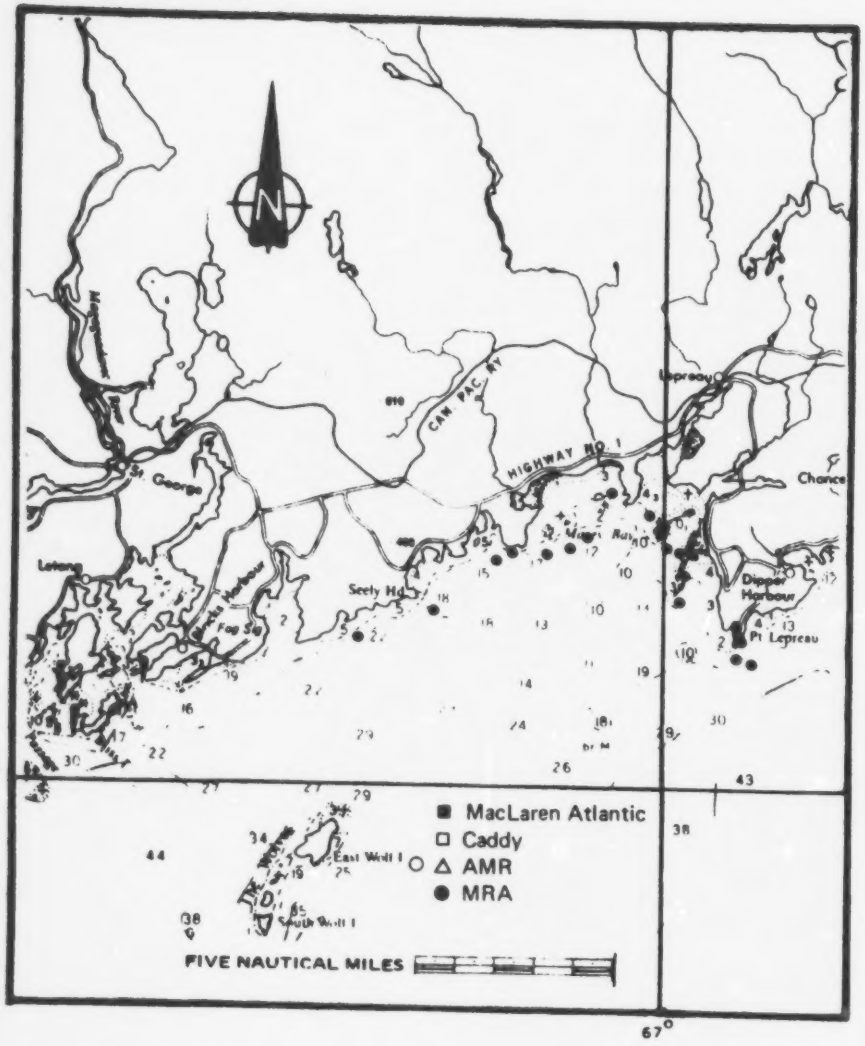
7.14.5
DISTRIBUTION OF ISOPODS

PEA POINT TO POINT LEPREAU



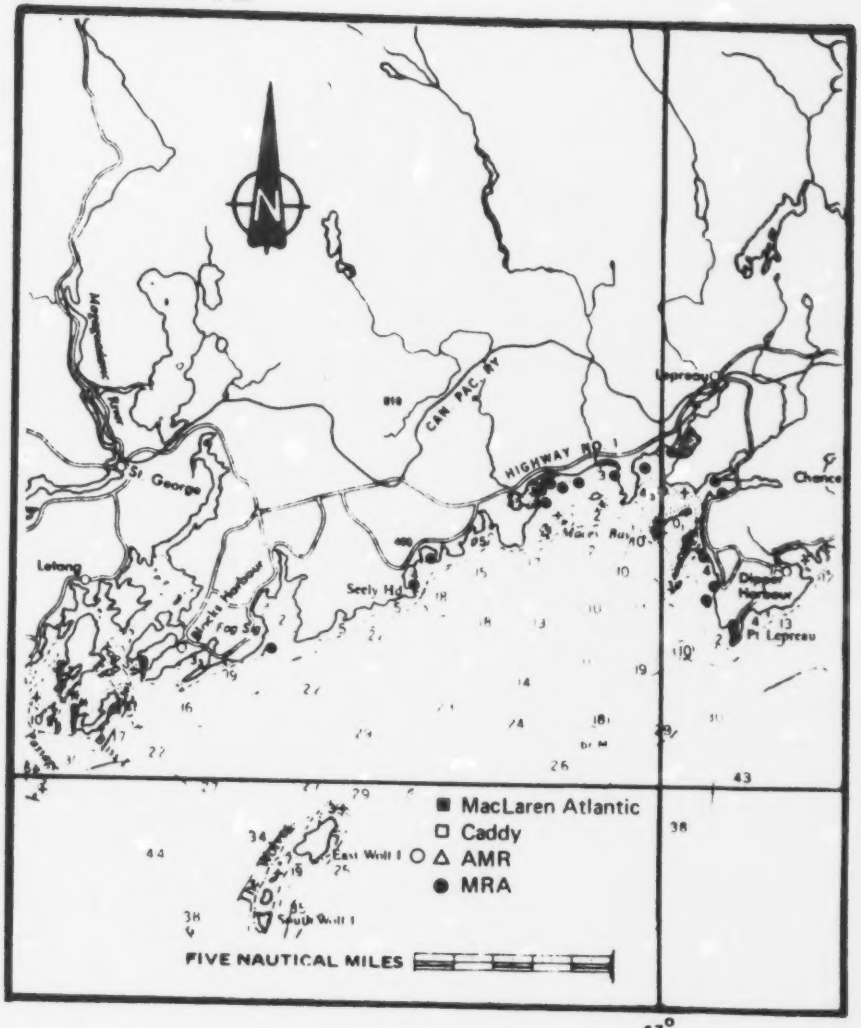
7.14.6
DISTRIBUTION OF
THE ROCK CRAB

PEA POINT TO POINT LEPREAU



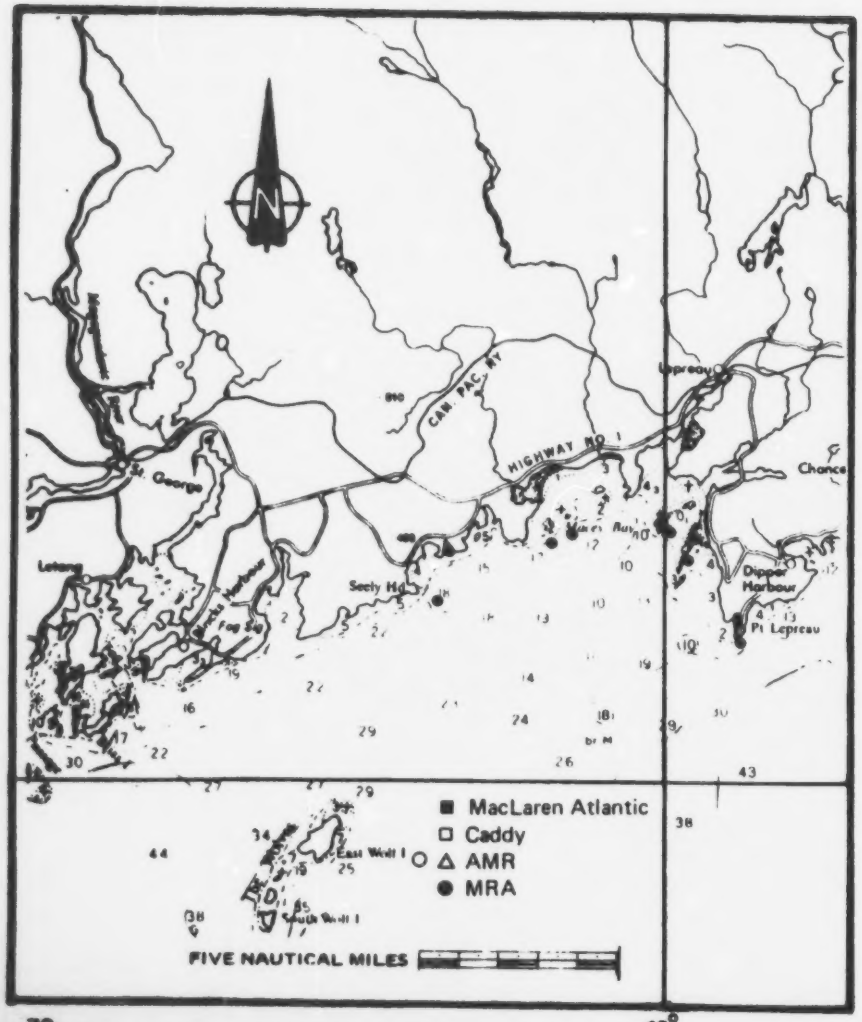
7.14.7
DISTRIBUTION OF
THE GREEN CRAB

PEA POINT TO POINT LEPREAU



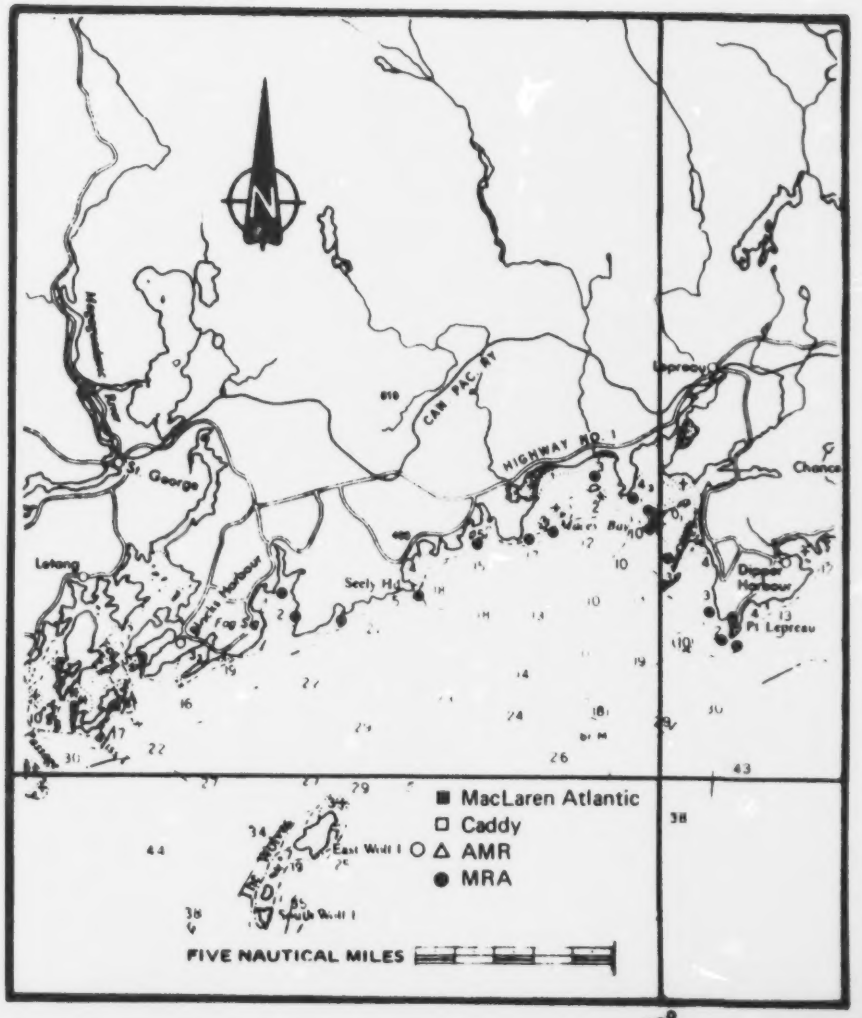
7.14.8
DISTRIBUTION OF THE TOAD CRAB

PEA POINT TO POINT LEPREAU



7.14.9
DISTRIBUTION OF THE HERMIT CRAB

PEA POINT TO POINT LEPREAU



ECHINODERMATA
(STARFISH, URCHINS, ETC.)

7.15 INTRODUCTION

Numerous species of Echinoderms occur in the Bay of Fundy. Some species occur intertidally but most are subtidal. In the study area, all major species were represented on a variety of substrates.

Sea urchins are the only species in this group with commercial value. Potential also exists for pharmaceutical utilization of chemicals extracted from certain species.

7.16 ANNOTATED LIST OF SPECIES

7.16.1 SCARLET PSOLUS/*Psolus fabricii* (Duben and Koren)

Description - Dorsal sides covered with scales; ten tentacles on anterior end; large sole with tube feet for attachment to rock; bright red, sometimes darkened by mud.

Habitat - Occurs subtidally on rock from low water to 50 feet.

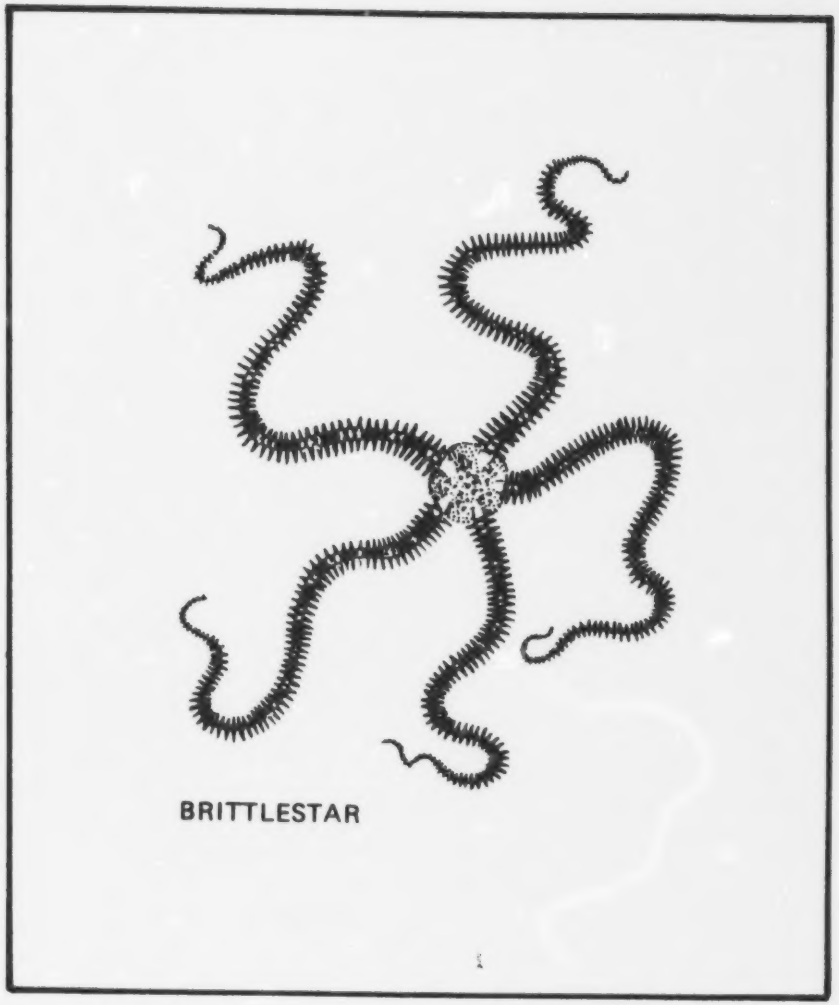
Distribution and Abundance -(Figure 7.16.1) - MRA (6-P, 8-P, 9-P, 32-P, 33-P, 35-P, 36-P, 37-P, 39-P).

7.16.2 NORTHERN SEA CUCUMBER/*Cucumaria frondosa* (Gunnerus)

Description - Cylindrical body with tube feet in five longitudinal lines; ten branching tentacles on anterior end; to 12 inches in length - black, grey, occasionally yellow or orange.

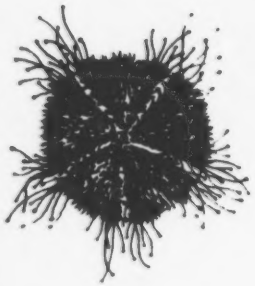
Habitat - Occurs subtidally on various substrates from 10 feet to depths in excess of 100 feet.

Distribution and Abundance (Figure 7.16.2). MRA (T4-C, 3-P, 6-C, 8-P, 18-P, 35-P, 36-P, 37-P, 39-P, 40-P).



BRITTLESTAR

7.16.3 SEA URCHINS/*Strongylocentrotus droebachiensis* (Muller)



Description - Circular with many sharp spines; to 4 inches in diameter; green.

Habitat - Occurs intertidally in tide pools and near the low water mark. Subtidally from low water to 50 feet and more, but most abundant to 20 feet. Occurs on various substrates.

Commercial Utilization - Good markets exist for sea urchins roe and development of this fishery is beginning in New Brunswick. Development of harvesting techniques are required to obtain economical returns from the study area where, although abundant, urchins occur on difficult bottom for harvesting.

Distribution and Abundance - (Figure 7.16.3) - MRA (T1-C, T4-P-C, 1-C, 2-A, 3-A, 6-A, 7-A, 8-A, 9-A, 10-A, 18-C, 31-P-C, 32-P, 33-P-C, 34-P-C, 35-C, 36-A, 37-A, 38-C, 39-A, 40-C); AMR (1-P, 2-P, 3-P); MacLaren (1-P); Caddy (117-P, 153-P).

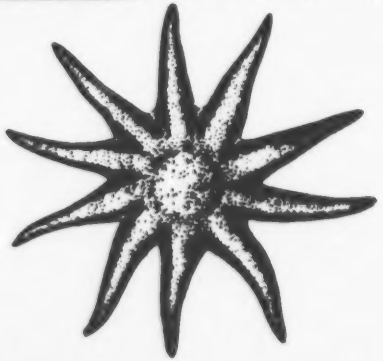
7.16.4 SAND DOLLARS/*Echinarachnius parma* (Lamark)

Description - Flat; circular; five petal-shaped rays on upper side; to 4 inches; dark brown to black.

Habitat - Occurs intertidally and subtidally on sand bottom to depths of 20 feet.

Distribution and Abundance - MRA T4-P).

7.16.5 PURPLE SUNSTAR/*Solaster endeca* (Linnaeus)

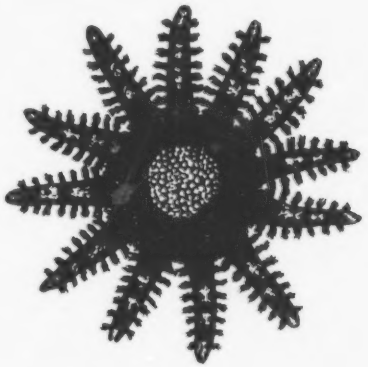


Description - Most commonly has 9 to 10 arms; to 16 inches in diameter; purple, yellow, orange

Habitat - Occurs subtidally on various substrates from low water to 50 feet.

Distribution and Abundance - (3-P, 8-P).

7.16.6 SPINY SUNSTAR/*Crossaster papposus* (Linnaeus)



Description - Usually 10-12 arms; bristle-like spines cover dorsal side; to 12 inches in diameter; usually red with white alternating bands; sometimes dark purple.

Habitat - Occurs subtidally from low water to depths in excess of 100 feet on various substrates.

Distribution and Abundance - MRA (34-P).

7.16.7 BLOODSTAR/*Henricia sp.*

Description - Five rayed; arms rounded; smooth; to 6 inches; red, orange, yellow.

Habitat - Occurs near low water intertidally and subtidally to depths in excess of 100 feet on rocky substrate.

Distribution and Abundance - (Figure 7.16.4) - MRA (8-C, 9-C, 18-P, 31-P, 32-P, 33-P, 34-P, 35-P, 36-C, 37-C, 38-P, 39-C, 40-P); Caddy (117-P, 119-P, 152-P).

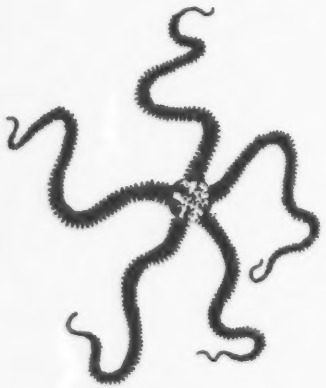
7.16.8 COMMON STARFISH/*Asterias vulgaris* (Verrill)

Description - Five rayed; moderately spiny; rarely to 20 inches;orange, yellow.

Habitat - Occurs intertidally near low water and subtidally to 50 feet on various substrates.

Distribution and Abundance -(Figure 7.16.5) - MRA (T1-P-C, T4-P, 1-P, 2-C, 3-P, 4-A, 6-C, 7-C, 8-C-A, 9-P, 10-C-A, 18-P, 31-P, 32-P-C, 33-P, 34-P, 35-P, 38-P-C, 36-P-C, 37-P-C, 39-P-C, 40-P); AMR (1-P, 2-P, 3-P); MacLaren (2-P); Caddy (119-P).

7.16.9 BRITTLESTAR/*Ophiopholis aculeata* (Linnaeus)



Description - Five delicate rays emerging from a circular disc; to 6 inches in diameter; various combinations of dark red and white.

Habitat - Occurs intertidally in tide pools and near low water. Subtidally under rocks and in ledge to depths in excess of 100 ft.

Distribution and Abundance - (Figure 7.16.6) - MRA (1-P, 3-A, 18-C, 31-P, 32-P-C, 35-P, 36-C-A, 37-C-A, 38-P, 39-C-A).

7.16.10 STARFISH/*Leptasterias sp.*

Description - Five rays; to 2 inches; dark green, dark brown.

Habitat - Occurs intertidally under rocks and in crevices near the low water mark.

Distribution and Abundance -(Figure 7.16.7) - MRA (T1-P, 8-C, 10-P, 34-C).

7.16.11 SEA CUCUMBER/*Leptosynapta*

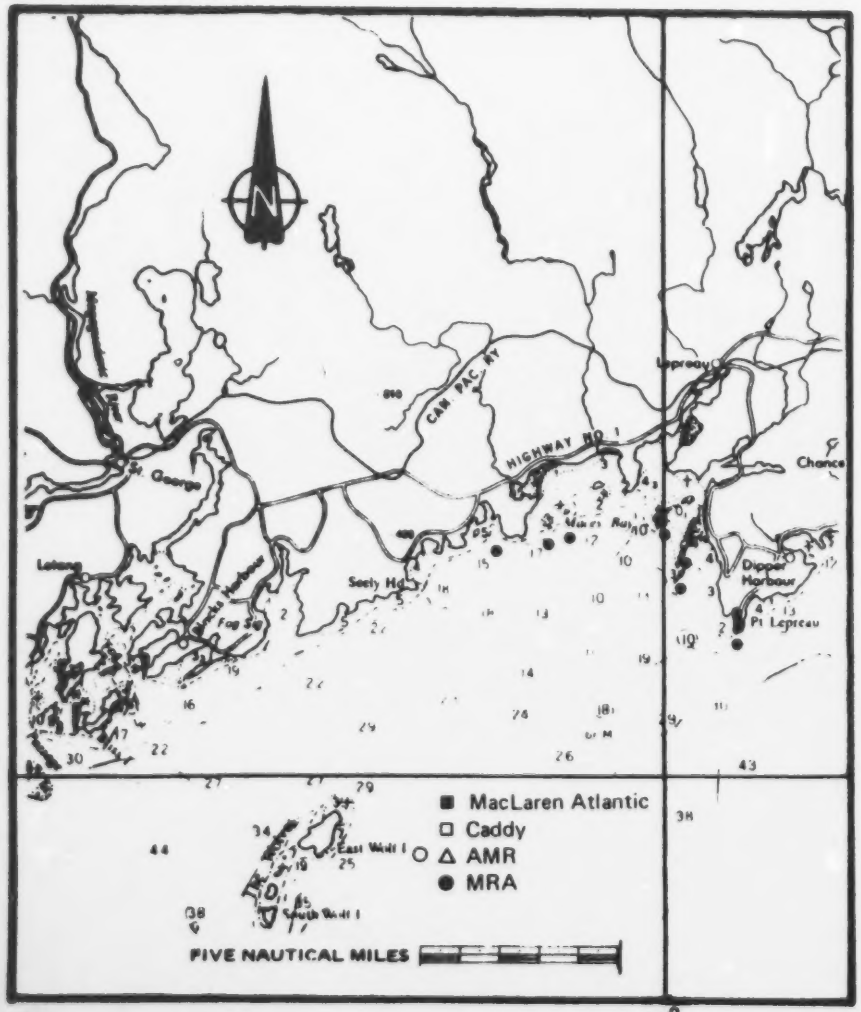
Description - Cylindrical cucumber; to 3½ inches; transparent with some white and pinkish shades.

Habitat - Occurs intertidally in sand, gravel ; occasionally in mud, and under rocks. Occurs subtidally in similar circumstances to 80 meters.

Distribution and Abundance - MRA (25-P, 28-P).

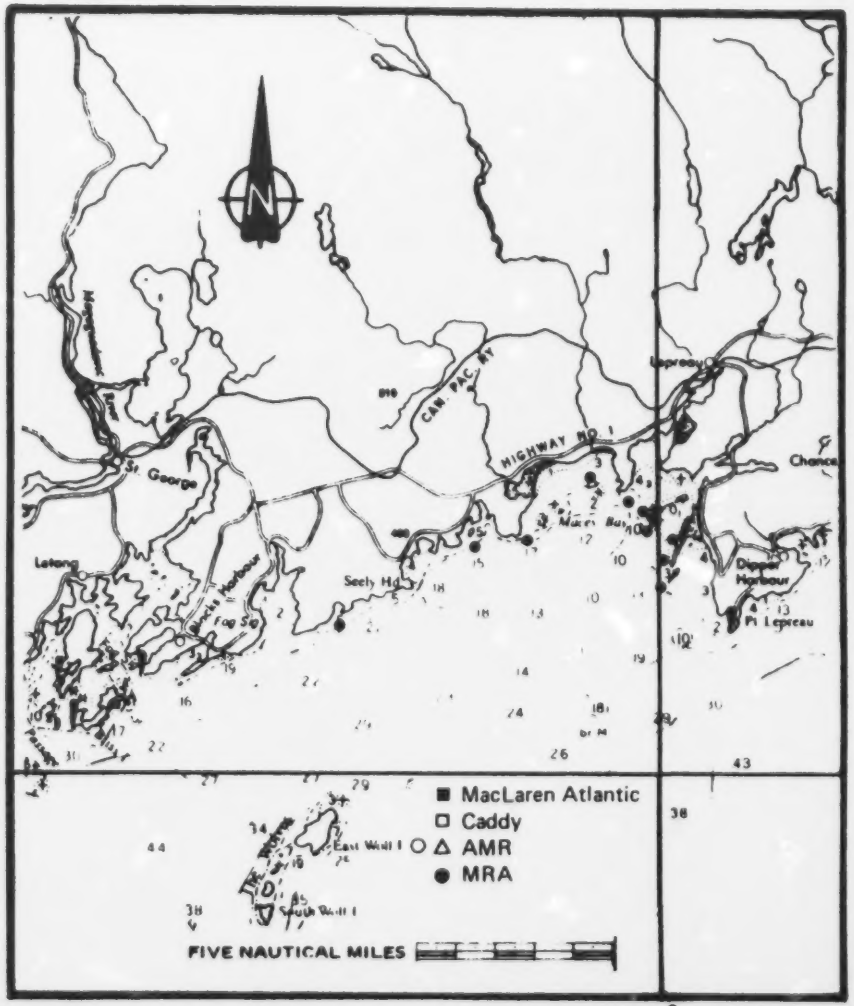
7.16.1
DISTRIBUTION OF SCARLET PSOLUS

PEA POINT TO POINT LEPREAU



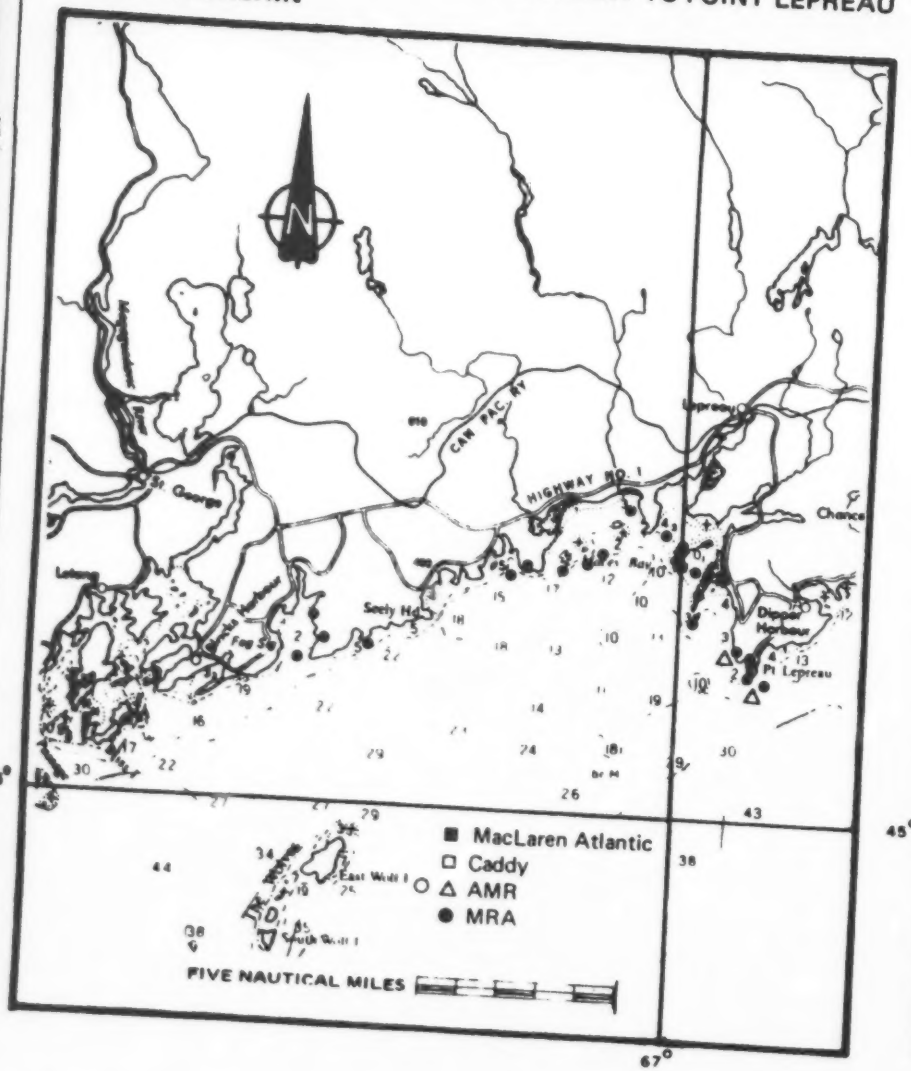
7.16.2
DISTRIBUTION OF NORTHERN SEA CUCUMBER

PEA POINT TO POINT LEPREAU



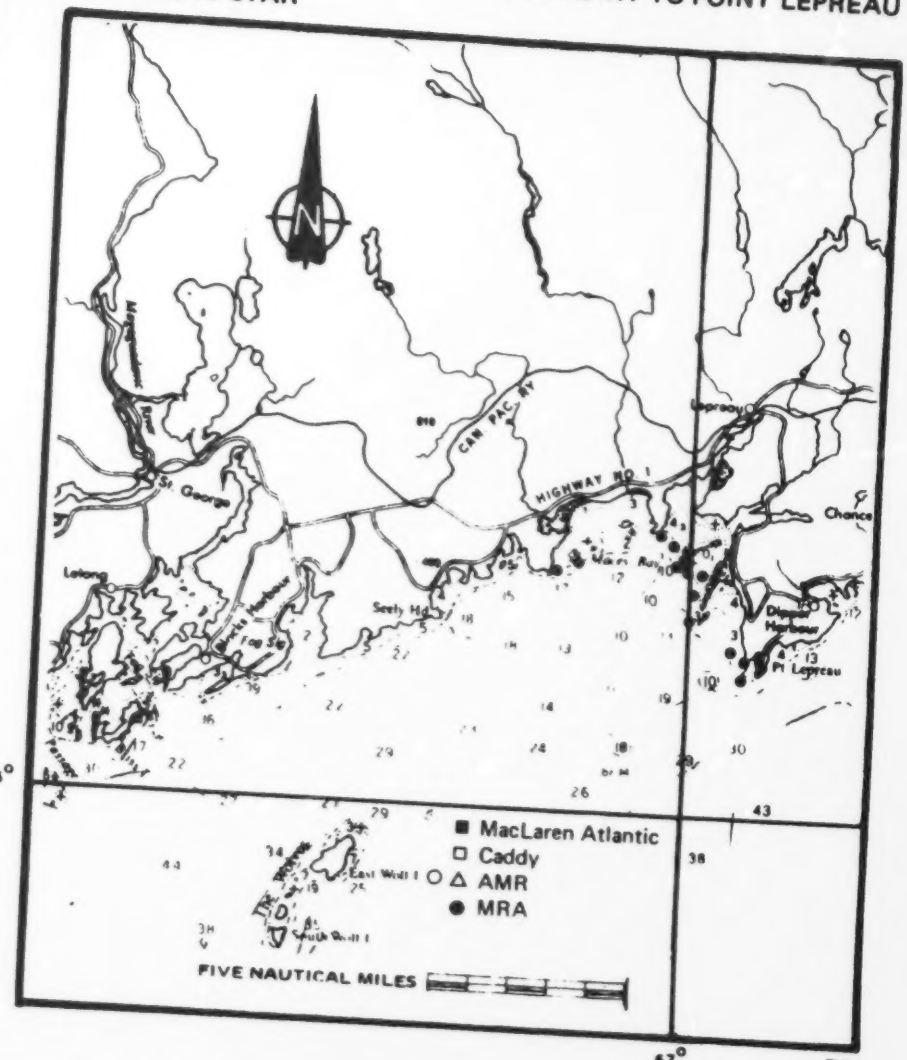
7.16.3
DISTRIBUTION OF THE SEA URCHIN

PEA POINT TO POINT LEPREAU



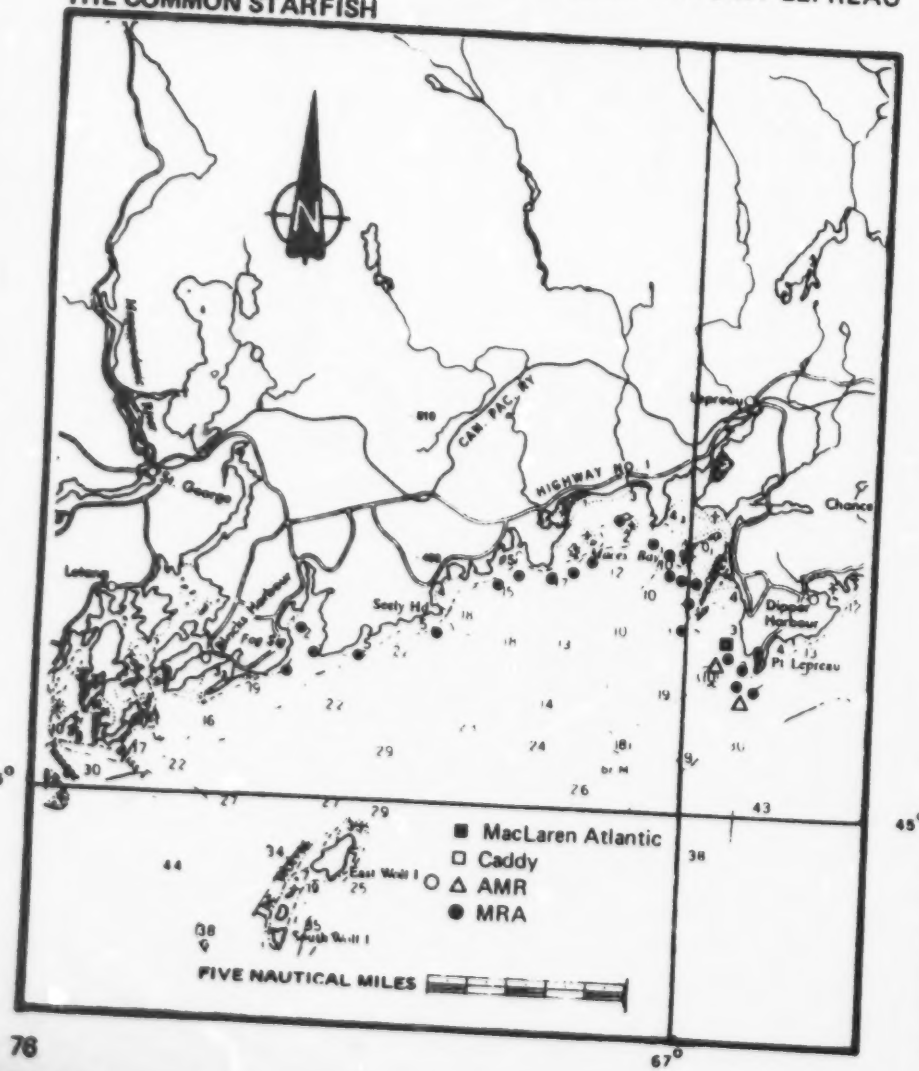
7.16.4
DISTRIBUTION OF THE BLOOD STAR

PEA POINT TO POINT LEPREAU



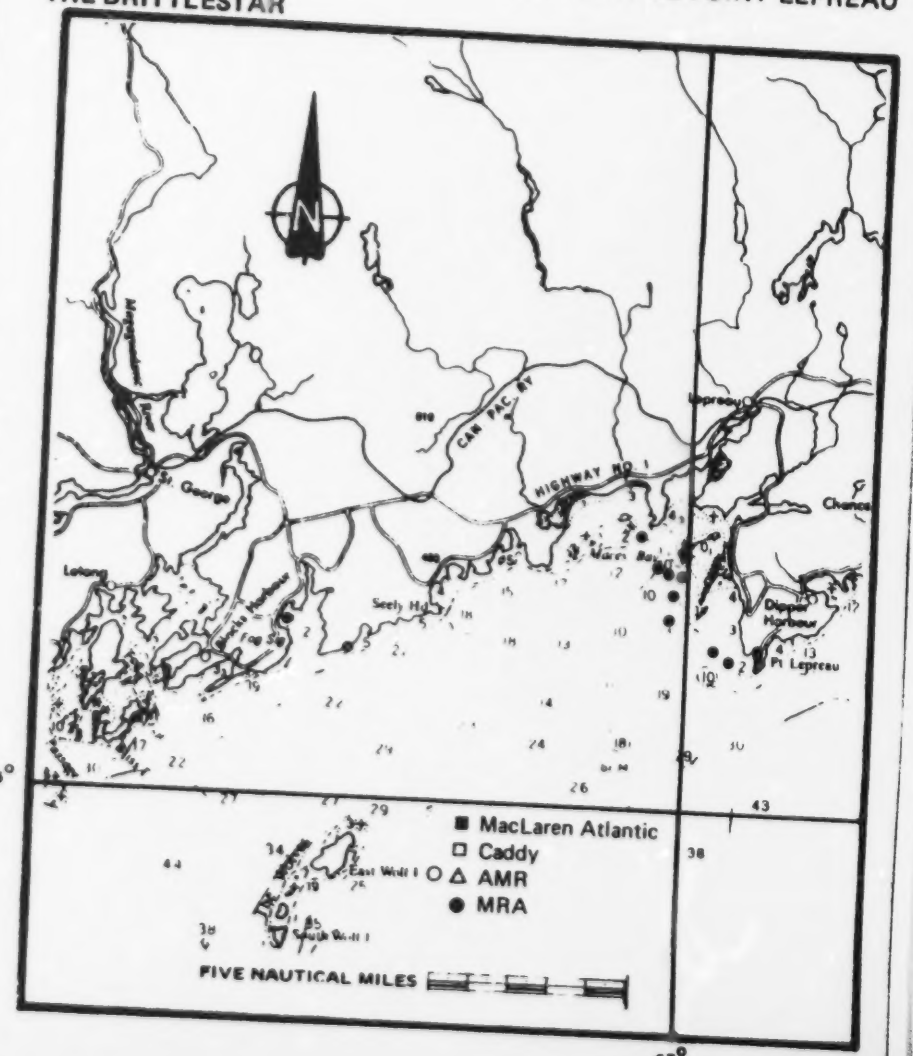
7.16.5
DISTRIBUTION OF
THE COMMON STARFISH

PEA POINT TO POINT LEPREAU



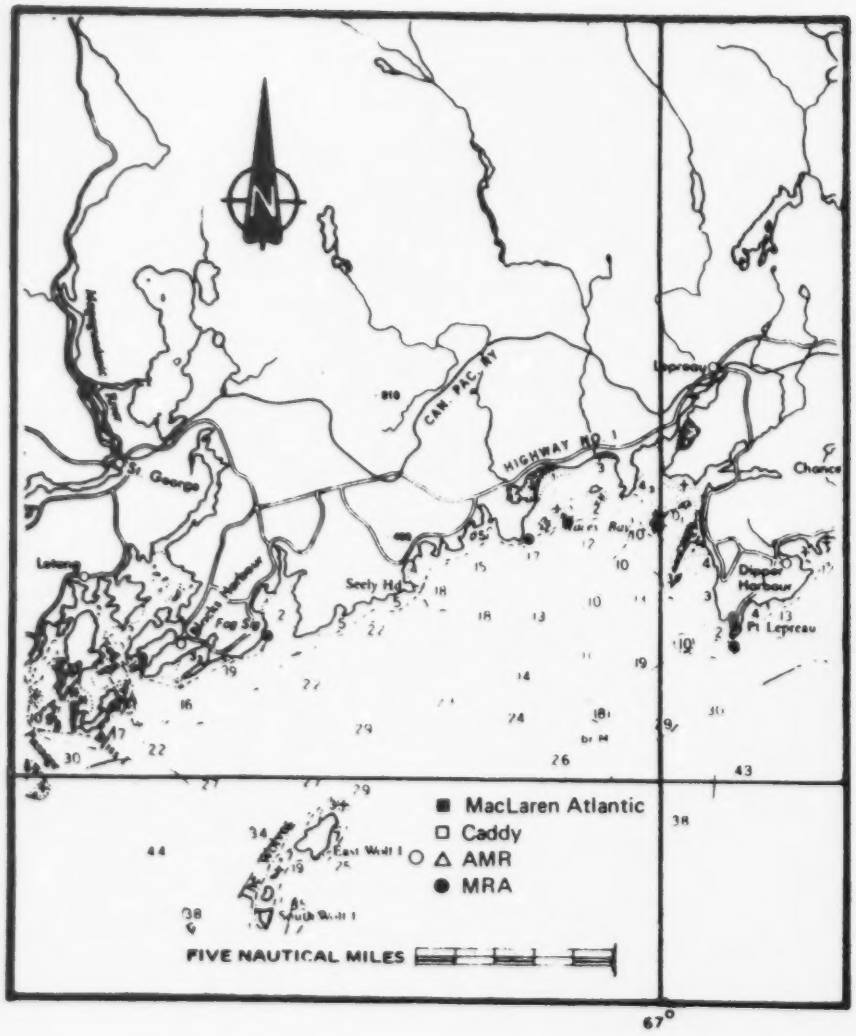
7.16.6
DISTRIBUTION OF
THE BRITTLESTAR

PEA POINT TO POINT LEPREAU



7.16.7
DISTRIBUTION OF THE STARFISH LEPTASTERIAS

PEA POINT TO POINT LEPREAU



PROTOCHORDATA
(SEA SQUIRTS, ACORN WORMS, ETC.)

7.17 INTRODUCTION

A limited number of species of protochordates occur in the Bay of Fundy. With the exception of the Acorn worm which occurs in mud flats, and a few sea squirts that occur under rocks in tide pools, protochordata are found subtidally on rock, mud or twine. In the study area three species were recorded, all subtidally. They were a common component of the local fauna.

While potential exists for the pharmaceutical utilization of chemicals extracted from certain species, the only commercial use at the present time is as a research animal.

7.18 ANNOTATED LIST OF SPECIES

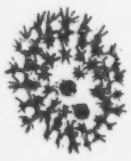
7.18.1 SEA POTATO/*Boltenia ovifera* (Linnaeus)

Description - Egg-shaped body on slender stalk to 18 inches; openings on body for filter feeding; orange-red; often encrusted with Bryozoa and other tunicates.

Habitat - Occurs subtidally from low water to well over 100 feet; on rock; also common on weir posts, shells of scallops and horse mussels.

Distribution and Abundance (Figure 7.18.1) - T1-P, T2-C, 1-P, 2-C to A, 3-C, 4-P to C, 5-P, 7-P to C, 8-P, 10-P, 12-P, *Distribution and Abundance* - (Figure 7.18.1) - MRA (6-P, 8-C, 9-C, 10-P, 31-P, 33-P, 34-P, 36-P, 37-P, 39-P, 40-P); Caddy (102-P, 117-A, 118-P, 119-P, 120-P, 152-P, 153-P).

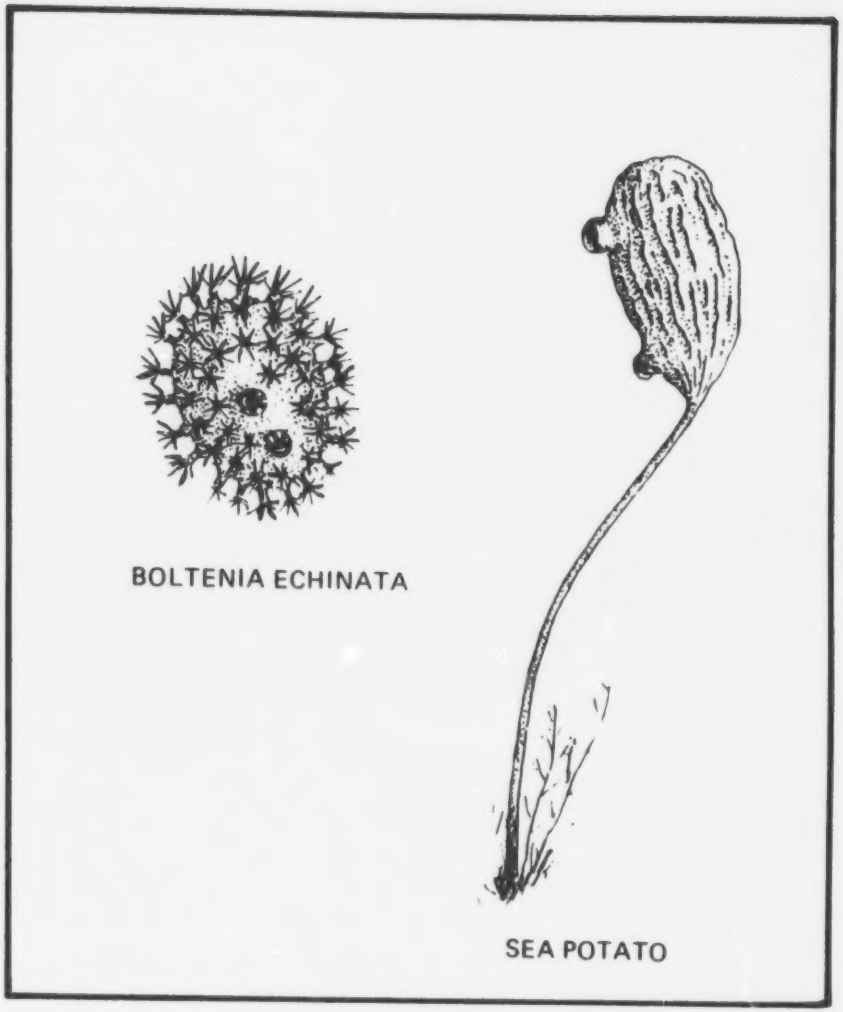
7.18.2 *Boltenia echinata* (Linnaeus)



Description - Cactus-like tubercles covering unstalked body; to 1 inch diameter; pink-red.

Habitat - Occurs subtidally under rocks, on other tunicates and on shells; from low water to over 100 feet

Distribution and Abundance - MRA (8-P).



7.18.3 SEA PEACH/*Halocynthia pyriformis* (Rothke)

Description - Barrel-shaped; to 4 inches; two apertures on top; orange, white.

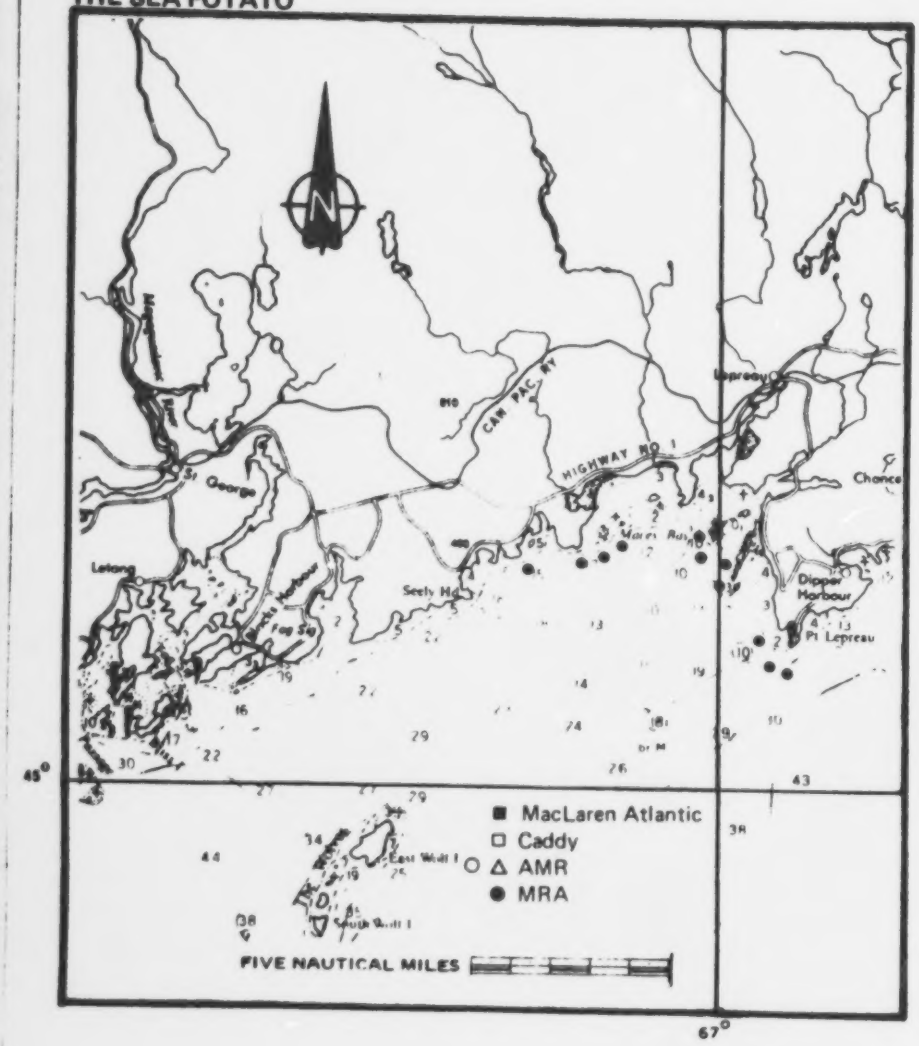
Habitat - Occurs attached to the upper surface of rocks, ledge, shells etc. from low water to depths in excess of 100 feet.

Commercial Utilization - Used as research animal by cancer researchers.

Distribution and Abundance - (Figure 7.18.2) - MRA (4-A, 6-C, 7-C, 8-C, 9-A, 10-C, 31-P, 32-C-A, 35-P, 36-C-A, 37-C-A, 38-P, 39-P-A, 40-P).

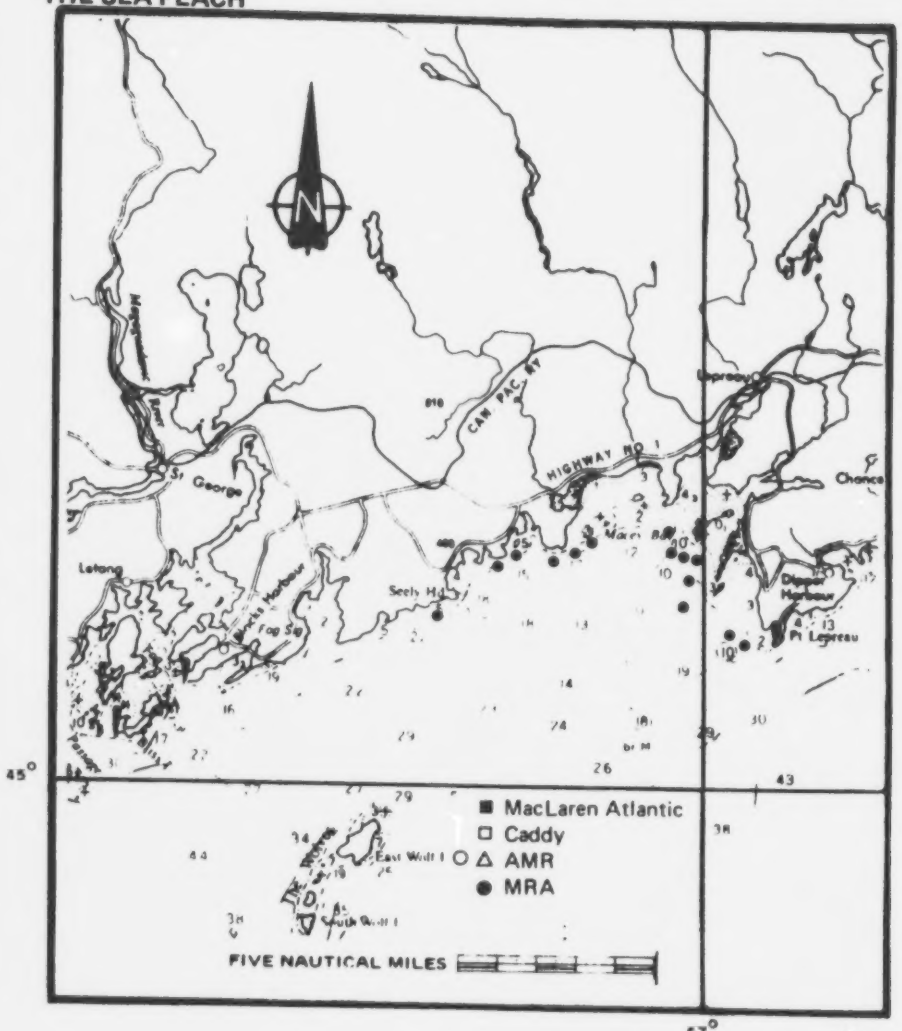
7.18.1
DISTRIBUTION OF THE SEA POTATO

PEA POINT TO POINT LEPREAU



7.18.2
DISTRIBUTION OF THE SEA PEACH

PEA POINT TO POINT LEPREAU



7.19 INTRODUCTION

Principal Commercial activities in the area revolve around the fishery (See Section 9). During the course of this survey, site records were kept for all fish species encountered. Other species which occur in the area but were not recorded, are given in Table 7.19.1.

7.20 ANNOTATED LIST OF SPECIES

7.20.1 WINTER FLOUNDER/*Pseudopleuronectes americanus* (Walbaum)

Description - A small flounder seldom exceeding 18 inches. See Leim and Scott (1966) for detailed description.

Habitat - This species occurs in bays and inlets and offshore. It was sighted in normal flounder habitat in the study area.

Commercial Utilization - A common commercial species. See Section 9.

Site Records - MRA (6-P, 8-P, 9-P, 16-P-C).

7.20.2 ANGLER, MONKFISH OR GOOSEFISH/*Lophius americanus* Valenciennes

Description - A grotesque fish with large flattened head and small tail. Captures prey with a fleshy "lure" located at the tip of a "rod" attached above the mouth. Reaches 4 feet in length and 50-60 pounds. See Leim and Scott (1966) for detailed description.

Habitat - Most frequently observed lying on mud or sand bottom.

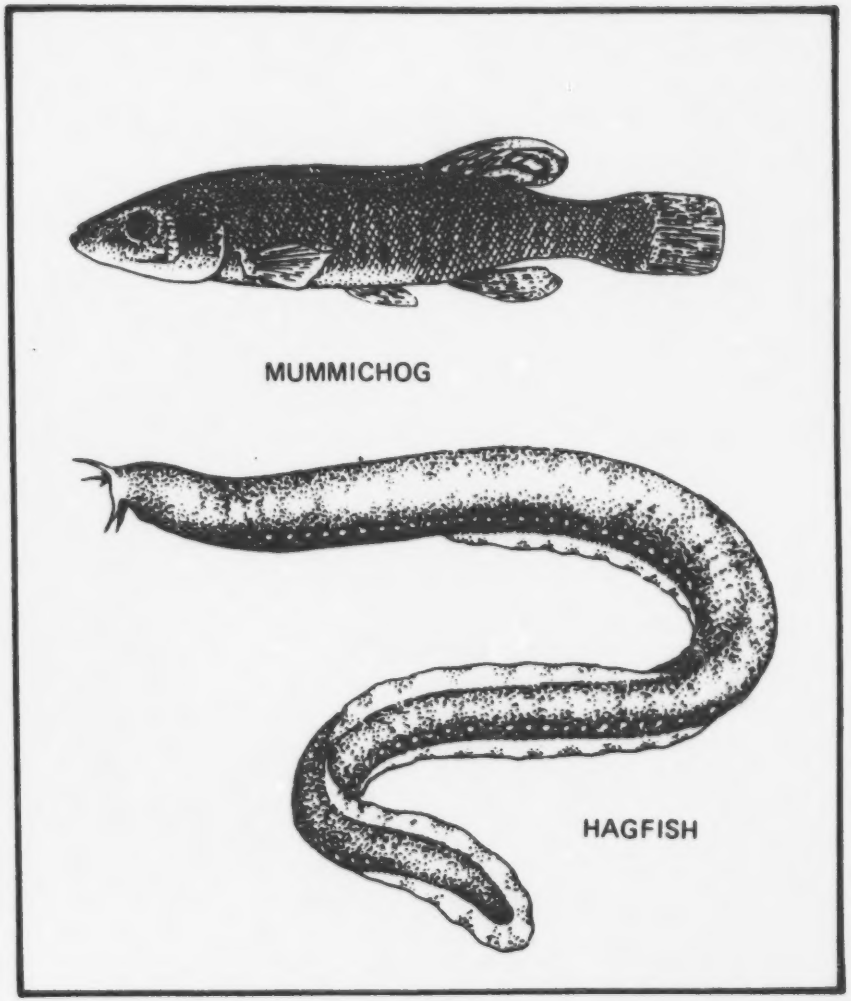
Site Records - T2-P.

7.20.3 HARBOUR POLLACK/*Pollachius virens* (Linnaeus)

Description - The young of Pollack, locally called "Harbour" Pollack, resemble the adults which reach 42 inches in length and a maximum weight of 60-70 pounds. See Leim and Scott (1966) for detailed description.

Habitat - As young, pollack occur in abundance around wharves, weirs and ledges.

Site Records - 1-P, 3-P.



MUMMICHOG

HAGFISH

7.20.9 BLENNY OR ROCK GUNNEL/*Pholis gunnellus* (Linnaeus)

Description - A small eel-like fish reaching 12 inches maximum length. See Leim and Scott (1966) for detailed description.

Habitat - Common intertidally and subtidally in rock rubble.

Site Records (Figure 7.20.3) - 5-P, 20-P, 24-P.

7.20.4 THREE-SPINE STICKLEBACK/*Gasterosteus aculeatus*

Description - Typical stickleback with three dorsal spines; to 3 inches; metallic silver with green shades; males develop red shades ventrally, varied breeding season.

Habitat - Occurs near shore, in estuaries, tidepools, salt ponds and also occurs in freshwater.

Site Records - MRA (21-P).

TABLE 7.19.1 FISHES RECORDED IN THE STUDY AREA AND VICINITY

MARSIPOBRANCHII

Myxine glutinosa (Hagfish)
Petromyzon marinus (Lamprey)

SELACHII

Carcharias taurus (Sand Shark)*
Alopias vulpinus (Thresher Shark)*
Carcharodon carcharias (White Shark)
Lamna nasus (Porbeagle)
Mustelus canis (Smooth Dogfish)*
Rhizoprionodon terraenovae (Atlantic Sharpnose Shark)*
Somniosus microcephalus (Greenland Shark)
Squalus acanthus (Spiny Dogfish)
Raja erinacea (Little Skate)
R. laevis (Barndoor Skate)
R. ocellata (Winter Skate)
R. radiata (Thorny Skate)
Torpedo nobiliana (Atlantic Torpedo)

PISCES

Acipenser oxyrhynchus (Atlantic Sturgeon)
Alosa pseudoharengus (Alewife)
A. sapidissima (American Shad)
Brevoortia tyrannus (Menhaden)*
Clupea harengus (Herring)
Etrumeus sadina (Round Herring)*
Coregonus clupeaformis (Lake Whitefish)*
Salmo salar (Atlantic Salmon)
Salvelinus fontinalis (Brook Trout)
Mallotus villosus (Capelin)*
Osmerus mordax (Smelt)
Mauroclicus muelleri (Muller's Pearlsides)*
Anguilla rostrata (American Eel)
Conger oceanicus (Conger Eel-larval)*
Scomberesox saurus (Atlantic Saury)*
Hyporhamphus sp. (Common Halfbeak)*
Fundulus heteroclitus (Mummichog)
Syngnathus fuscus (Northern Pipefish)
Apeltes quadracus (Fourspine Stickleback)
Gasterosteus aculeatus (Threespine Stickleback)
G. wheatlandi (Blackspotted Stickleback)
Pungitius pungitius (Ninespine Stickleback)
Brosme brosme (Cusk)
Enchelyopus cimbrius (Fourbeard rockling)
Gadus morhua (Atlantic Cod)
Melanogrammus aeglefinus (Haddock)
Merluccius bilinearis (Silver Hake)
Microgaddus tomcod (Atlantic Tomcod)
Pollachius virens (Pollock)
Urophycis chuss (Squirrel Hake)
Nezumia bairdi (Marlin Spike)*
Zenopsis ocellata (American John Dory)*
Roccus americanus (White Perch)
R. saxatilis (Striped Bass)
Stenotomus chrysops (Scup)*
Tautoga onitis (Tautog)*
Tautogolabrus adspersus (Cunner)
Ammodytes americanus (American Sand Lance)
Sarda sarda (Atlantic Bonito)*
Scomber colias (Chub Mackerel)
S. scombrus (Atlantic Mackerel)
Thunnus thynnus (Bluefin Tuna)
Anarhichas lupus (Atlantic Wolffish)
A. minor (Spotted Wolffish)*
Pholis gunnellus (Rock Gunnell)
Cryptacanthodes maculatus (Wrymouth)
Lumpenus lumpretaeformis (Snake Blenny)
Ulvaria subbifurcata (Radiated Shanny)
Lycenchelys verrilli (Wolf Eelpout)*
Macrozoarces americanus (Ocean pout)
Poronotus triacanthus (Butterfish)
Menidia menidia (Atlantic Silverside)
Sebastes marinus (Redfish)
Prionotus carolinus (Northern Searobin)
P. evolans (Striped Searobin)*
Artediellus uncinatus (Arctic Hookear Sculpin)*
Gymnocanthus tricuspis (Arctic Staghorn Sculpin)*
Hemitripterus americanus (Atlantic Sea Raven)
Myoxocephalus octodecemspinosus (Longhorn Sculpin)
M. scorpius (Shorthorn Sculpin)
Triglops murrayi (Mailed Sculpin)*
Aspidophoroides monopterygius (Alligatorfish)*
Cyclopterus lumpus (Lumpfish)
Eumicrotremus spinosus (Atlantic Spiny Lumpfish)*
Liparis atlanticus (Atlantic Seasnail)
L. liparis (Striped Seasnail)
Paralichthys dentatus (Summer Flounder)*
P. oblongus (Fourspot Flounder)*
Scophthalmus aquosus (Windowpane)
Glyptocephalus cynoglossus (Witch Flounder)
Hippoglossoides platessoides (American Plaice)
H. hippoglossus (Atlantic Halibut)
Liopsetta putnami (Smooth Flounder)
Pseudopleuronectes americanus (Winter Flounder)
Monacanthus hispidus (Planehead Tilefish)*
Mola mola (Ocean Sunfish)*
Lophius americanus (Monkfish)

* RARE OR OCCASIONAL OCCURRENCE.

BIRDS

7.21 INTRODUCTION

Both inshore and pelagic species of birds can be found in the study area. During the course of this study, site records were kept for all species observed. Other species which have been recorded are listed in Table 7.21.7

7.22 ANNOTATED LIST OF SPECIES

7.22.1 DOUBLE-CRESTED CORMORANT/*Phalacrocorax auritus* (Lesson)

General - Abundant in Maces Bay where it breeds.

7.22.2 BLACK GUILLEMOT/*Cepphus grylle* (Linnaeus)

General - A common species in the Bay of Fundy. A few were seen in the study area.

7.22.3 COMMON EIDER/*Somateria mollissima* (Linnaeus)

General - A common Bay of Fundy duck, this species is abundant in the study area where it probably breeds.

7.22:4 HERRING GULL/*Larus argentatus* Pontoppidan

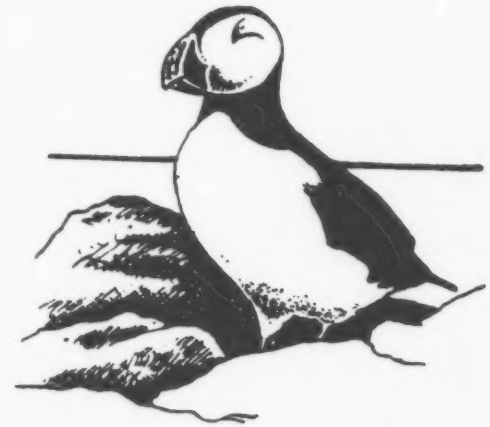
General - The Herring Gull is abundant in the study area.

7.22.5 GREAT BLACK-BACKED GULL/*Larus marinus* Linnaeus

General - The Black-backed Gull is common in the study area.

7.22.6 TERNS/*Sterna hirundo*
S. paradisaea Pontoppidon

General - Both Common and Arctic Terns occur in the area.



PUFFIN

TABLE 7.21.7 MARINE BIRDS OCCURRING IN THE STUDY AREA AND VICINITY.

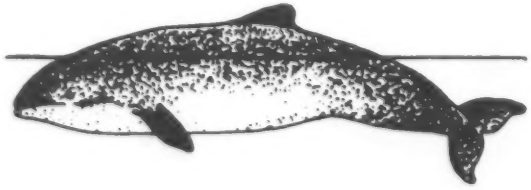
Gavia immer immer (Common Loon)
Gavia stellata (Red-throated Loon)
Colymbus grisegena holboelli (Holboell's Grebe)
Colymbus auritus (Horned Grebe)
Podilymbus podiceps podiceps (Pied-billed Grebe)
Thalassogeron chlororhynchos (Yellow-nosed Albatross)
Puffinus griseus (Sotty Shearwater)
Puffinus gravis (Greater Shearwater)
Fulmarus glacialis (Atlantic Fulmar)
Oceanodroma leucorhoa (Leach's Petrel)
Oceanites oceanicus (Wilson' Petrel)
Moris bassana (Gannet)
Phalacrocorax carbo carbo (European Cormorant)
Phalacrocorax auritus auritus (Double-crested Cormorant)
Ardea herodias herodias (Great Blue Heron)
Butorides virescens virescens (Eastern Green Heron)
Nycticorax nycticorax hoactli (Black-crowned Night Heron)
Botaurus lentiginosus (American Bittern)
Ixobrychus exilis (Least Bittern)
Branta canadensis canadensis (Common Canada Goose)
Branta bernicla hrota (American Brant)
Anas platyrhynchos (Mallard)
Anas rubripes (Black Duck)
Dafila acuta tzitzihoa (American Pintail)
Nettion carolinense (Green-winged Teal)
Querquedula discors (Blue-winged Teal)
Nyroca marila (Greater Scaup Duck)
Glaucionetta clangula americana (American Golden-eye)
Charitonetta albeola (Buffle-head)
Clangula hyemalis (Old-squaw)
Somateria mollissima dresseri (American Eider)
Melanitta deglandi (White-winged Scoter)
Melanitta perspicillata (Surf Scoter)
Oidemia americana (American Scoter)
Mergus serrator (Red-breasted Merganser)
Porzana carolina (Sora)
Charadrius melodus (Piping Plover)
Charadrius semipalmatus (Semipalmated Plover)
Oxyechus vociferus vociferus (Killdeer)
Pluvialis dominica dominica (American Golden Plover)
Squatarola squalarola (Black-bellied Plover)
Arenaria interpres morinella (Ruddy Turnstone)
Actitis (Spotted Sandpiper)
Totanus melanoleucus (Greater Yellow-legs)
Totanus flavipes (Lesser Yellow-legs)
Arquatella maritima (Purple Sandpiper)
Pisobia melanotos (Pectoral Sandpiper)
Pisobia fuscicollis (White-rumped Sandpiper)
Pisobia minutilla (Least Sandpiper)
Pelidna alpina sakhalina (Red-backed Sandpiper)
Limnodromus griseus (Dowitcher)
Ereunetes pusillus (Semipalmated Sandpiper)
Crocethia alba (Sanderling)
Phalaropus fulicarirus (Red Phalarope)
Lobipes lobatus (Northern Phalarope)
Stercorarius parasiticus (Parasitic Jaegar)
Larus hyperboreus (Glaucous Gull)
Larus leucopterus (Iceland Gull)
Larus marinus (Great Black-backed Gull)
Larus argentatus smithsonianus (Herring Gull)
Larus philadelphia (Bonaparte's Gull)
Rissa tridactyla tridactyla (Atlantic Kittiwake)
Sterna hirundo hirundo (Common Tern)
Sterna paradisaea (Arctic Tern)
Alca torda (Razor-billed Auk)
Uria aalge aalge (Atlantic Murre)
Uria lomvia lomvia (Brunnich's Murre)
Alle alle (Dovekie)
Cepphus grylle grylle (Black Guillemot)
Fratercula arctica arctica (Atlantic Puffin)

MAMMALS
(SEALS, PORPOISE, WHALES)

7.23 INTRODUCTION

Several species of marine mammals have been recorded in the waters of the study area. These include: the Harbour Seal, Harbour Porpoise, Minke Whale, Pothead Whale, Finback Whales and Northern Right Whale. Only the Harbour Porpoise and Harbour Seal were observed during this study and only in moderate numbers.

HARBOUR SEAL



HARBOUR PORPISE

PLANTS
(SEAWEEDS, ETC.)

7.25 INTRODUCTION

Numerous species of marine plants occur intertidally and subtidally in the Bay of Fundy. They are most abundant and diverse in the intertidal area and in shallow subtidal waters. The majority of species occur on hard substrate but some species (Enteromorpha, Ulva) occur on mudflats. In the study area marine plants are a common component of intertidal and subtidal zones and, due to the rugged nature of the coast, occur almost exclusively on hard substrate.

Potential exists for commercial utilization of a variety of marine algae (rockweed, kelp, etc.), harvesting and marketing has yet to be developed.

7.26 ANNOTATED LIST OF SPECIES

7.26.1 IRISH MOSS/*Chondrus crispus* (Stackhouse)

Description - Profusely branched clumps usually less than 3 inches high; dark red, almost black with blue iridescence showing on branches.

Habitat - Common near the low water mark on rocks or ledge, often mixed with dulse.

Commercial utilization - Harvested elsewhere for use in food products and other commercial materials. Irish moss does not occur in large enough quantities in the study area for commercial operations.

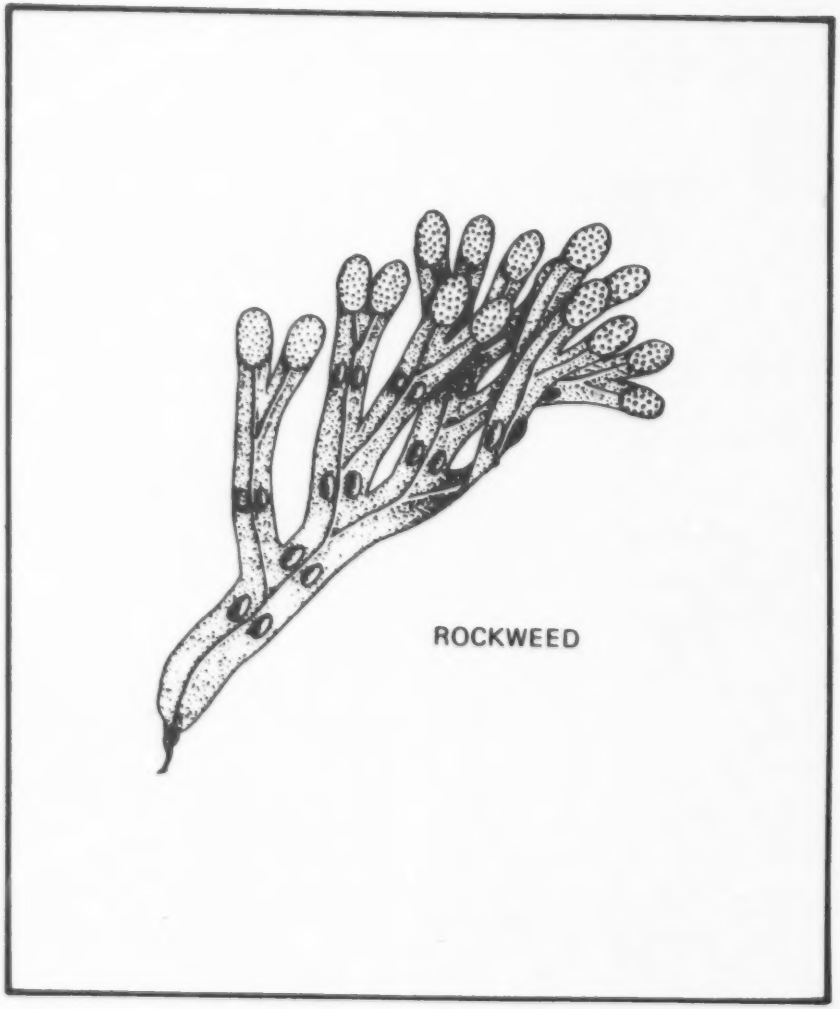
Distribution and Abundance (Figure 7.26.1) - MRA (T1-P-C, T2-P-C, T3-P, T5-P-C, 5-C, 15-P-C, 17-P, 19-P, 22-P, 25-C, 27-P-C, 28-P,C, 30-P, 31-P, 33-P, 34-P-A); AMR (1-P, 2-P, 3-P); MacLaren (I-P, 2-P, 7-P, 8-P).

7.26.2 CORAL ALGA/*Lithothamnion sp.* (Aresch)

Description - Encrusting, calcareous; occasionally free clumps to 5 inches in diameter; light pink.

Habitat - Occasionally on rocks and shells in tide pools. Abundant from low water to 60 feet on ledge, rocks and shells.

Distribution and Abundance (Figure 7.26.2) - MRA (T1-P-A, T2-P, T3-P, T4-P-C, T5-P, 2-C, 3-A, 4-C-A, 6-A, 7-A, 8-A, 9-A, 10-A, 15-P, 18-P, 27-P, 28-P-C, 30-P, 31-P-C, 32-P-C, 33-C, 34-C, 35-P-C, 36-A, 37-A, 38-P, 39-A, 40-P-C); AMR (1-P, 3-P).



ROCKWEED

7.26.3 DULSE/*Rhodymenia palmata* (Greville)

Description - Flat, branching fronds growing from a holdfast; fronds to 18 inches depending on habitat; varying shades of dark red.

Habitat - On rocks, occasionally in tide pools; most common around low water mark and subtidally to 5 feet on rocks and ledge.

Commercial Utilization - Harvested by hand, dried and cleaned, this species is marketed as a food product. It is also ground and sold for use in the food industry.

Distribution and Abundance - (Figure 7.26.3) - MRA (T1-P-C, 27-C, 29-P, 30-P); AMR (1-P, 3-P).

7.26.4 RED ALGA/*Phycodrys rubens* (Batters)

Description - Thin-veined fronds growing from a holdfast; to 5 inches; dark red.

Habitat - Occurs subtidally to thirty feet on rocky substrate.

Distribution and Abundance - MRA (32-C, 33-C, 38-P); AMR (1-P).

7.26.5 RED ALGA/*Polysiphonia lanosa* (Tandy)

Description - Small, multi-branched; to 2 inches; dark reddish-brown.

Habitat - Intertidal, growing on rockweed (*Ascophyllum* only)

Distribution and Abundance - (Figure 7.26.4) - MRA (T1-P-A, T2-P-C, T5-A, 5-C, 11-P, 13-C, 15-C, 16-P, 17-A, 19-P, 21-C, 25-C, 27-C, 28-P, 30-A); MacLaren (1-P, 2-P, 3-P, 4-P, 5-P, 6-P, 7-P, 8-P, 9-P).

7.26.6 NORI/*Porphyra sp.*

Description - Filmy sheets to 12 inches; red-brown; transluscent.

Habitat - Occurs intertidally on rocks, weir posts, wharves and subtidally on rocks.

Commercial Utilization - Potential exists for development of this alga for exportation to Japan.

Distribution and Abundance - (Figure 7.26.5) - MRA (T1-P, T5-P-C, 13-P-C, 15-C, 17-P, 24-P, 25-P-A, 27-C, 30-P).

7.26.8 KELP, DEVIL'S APRON/*Laminaria sp.*

Description - Long, flat, heavy frond from heavy stem and holdfast; to 10 feet; golden brown-dark brown. Species recorded for this area include: *L. longicruris, L. saccharina* and *L. digitata.*

Habitat - Occurs from low water to 10 feet on rocks.

Commercial Utilization - Used in food and chemical production (Kombu and Alginates). Stocks are abundant in the study area.

Distribution and Abundance - (Figure 7.26.7) - MRA (T4-P-A, 3-C, 4-C, 18-P, 20-C, 24-P-C, 25-C, 28-P, 31-C, 33-P, 34-P-A, 38-C); Thomas (2-P, 5-P).

7.26.9 SEA COLLANDER/*Agarum cribrosum* (Bory)

Description - Kelp-like frond perforated with circular holes; distinct heavy midrib and holdfast; to 2 feet; golden, dark brown.

Habitat - Occurs occasionally in tide pools on rock. Most common subtidally to 40 feet on rocks and ledge.

Distribution and Abundance - (Figure 7.26.8) - MRA (3-A, 6-C, 7-P-C, 8-A, 9-A, 10-A, 28-P, 31-P-C, 32-P-C, 34-P, 35-P, 36-P, 37-P, 38-C, 39-P, 40-P); AMR (3-P).

7.26.10 WINGED KELP/*Alaria esculenta*

Description - Oval midrib; thin transluscent main blade; smaller blades below large blade; branched holdfast; to 5 feet; golden, dark brown.

Habitat - Occurs occasionally in tide pools on rock; most common subtidally from low water to 5 feet on rocks.

Commerical utilization - Although edible,no market exists at present (Neish, 1973).

Distribution and Abundance - (Figure 7.26.9) - MRA (T1-C, T2-P-C, 4-C, 8-A, 9-A, 10-A, 29-P, 31-P, 34-A, 38-P); MacLaren (1-P).

7.26.11 ROCKWEED/*Ascophyllum nodosum* (Le Jolis)

Description - Multi-branching narrow fronds with many air bladders; to 4 feet; light to dark green.

Habitat - Most common intertidal algae. Occurs on rocks; does not grow subtidally.

Commercial Utilization - Although used to produce rockweed meal, no harvesting currently takes place due to lack of market.

Distribution and Abundance - (Figure 7.26.10) - MRA (T1-P-C, T2-P-A, T3-P-A, T5-A, 5-A, 11-C, 13-C, 15-P-A, 16-P-A, 17-C-A, 19-A, 21-P, 22-P-C, 23-P, 25-C-A, 26-P, 27-C-A, 28-P-A, 29-P-A, 30-A); AMR (1-P, 3-P); MacLaren (1-P, 2-P, 3-P, 4-P, 5-P, 6-P, 7-P, 8-P, 9-P); (Thomas - 14-P, 10-P, 11-P, 9-P, 2-P, 5-P).

7.26.12 ROCKWEED/*Fucus vesiculosus* (Linnaeus)
F. spiralis (Linnaeus)
F. edentatus (De La Pylaie)

Description - *F. vesiculosus* - Flat, multi-branching fronds with air bladders; to 18 inches; solid single holdfast; yellow, green-brown.

F. spiralis - Flat fronds; no air bladders; to 6 inches; solid single holdfast; yellow-brown.

F. edentatus - Flat fronds; no air bladders; to 18 inches; solid single holdfast; dark olive green-brown.

Habitat - *F. vesiculosus* - The most common species, it occurs intertidally from a few feet from high water to within a few feet of low water.

F. spiralis - This species occurs in a narrow band a few feet from high water.

F. edentatus - This species occurs at and near low water on rocks.

Commercial Utilization - These species may be used in the production of rockweed meal. No harvesting presently takes place due to lack of market.

Distribution and Abundance (Figures 7.26.11 to 7.26.13)

Fucus edentatus

MRA (T1-A, T5-P-C, 12-P, 14-P, 17-P-C, 19-P-C, 27-P, 28-P, 29-P, 30-P, 34-P); MacLaren (1-P, 2-P, 4-P, 8-P, 7-P); Thomas (2-P, 5-P).

Fucus spiralis

MRA (15-P, 21-C, 28-P); MacLaren (1-P, 2-P, 3-P, 4-P, 5-P, 6-P, 8-P, 9-P); Thomas (2-P, 5-P).

Fucus vesiculosus

MRA (T1-P-C, T3-P-C, T3-P-C, T5-P-A, 5-P, 11-C, 13-C, 15-P, 16-P, 17-C, 17-P-C, 20-C, 21-P, 22-C, 23-P, 24-P, 25-C, 26-P, 27-C, 28-P, 29-P-A, 30-C); MacLaren (1-P, 2-P, 3-P, 4-P, 5-P, 6-P, 7-P, 8-P, 9-P); Thomas (2-P, 5-P).

7.26.13 SEA LETTUCE/*Ulva sp.*

Description - This species resembles a lettuce leaf; to 18 inches; translucent green.

Habitat - Occurs intertidally in tide pools, mud flats, and on rock to low water. Also occurs, in some areas, subtidally on rock, to about 5 feet.

Commercial Utilization Can be used as a seasoning but at present there is no local market.

Distribution and Abundance - (Figure 7.26.14) - MRA (T1-P-C, T4-P-C, T5-P-C, 13-C, 14-P-C, 17-P-C, 18-C, 19-C, 20-C, 21-C, 23-P, 24-P, 25-C, 26-P, 27-C-A, 28-P, 29-P, 30-P, 31-C, 33-C, 35-P, 38-C); AMR (1-P); MacLaren (1-P).

7.26.14 GREEN ALGA/*Enteromorpha sp.*

Description - Filamentous algae; to 3 feet in length; green, often colored by mud.

Habitat - Occurs intertidally on mudflats and rocks from mid littoral to low water.

Distribution and Abundance - (Figure 7.26.15) - MRA (T1-P-C, T5-P-C, 13-C, 15-P, 17-P, 21-C, 22-C, 24-P, 27-A); MacLaren (1-P, 3-P, 4-P, 7-P).

7.26.15 CORALLINE ALGA/*Corallina officinalis*

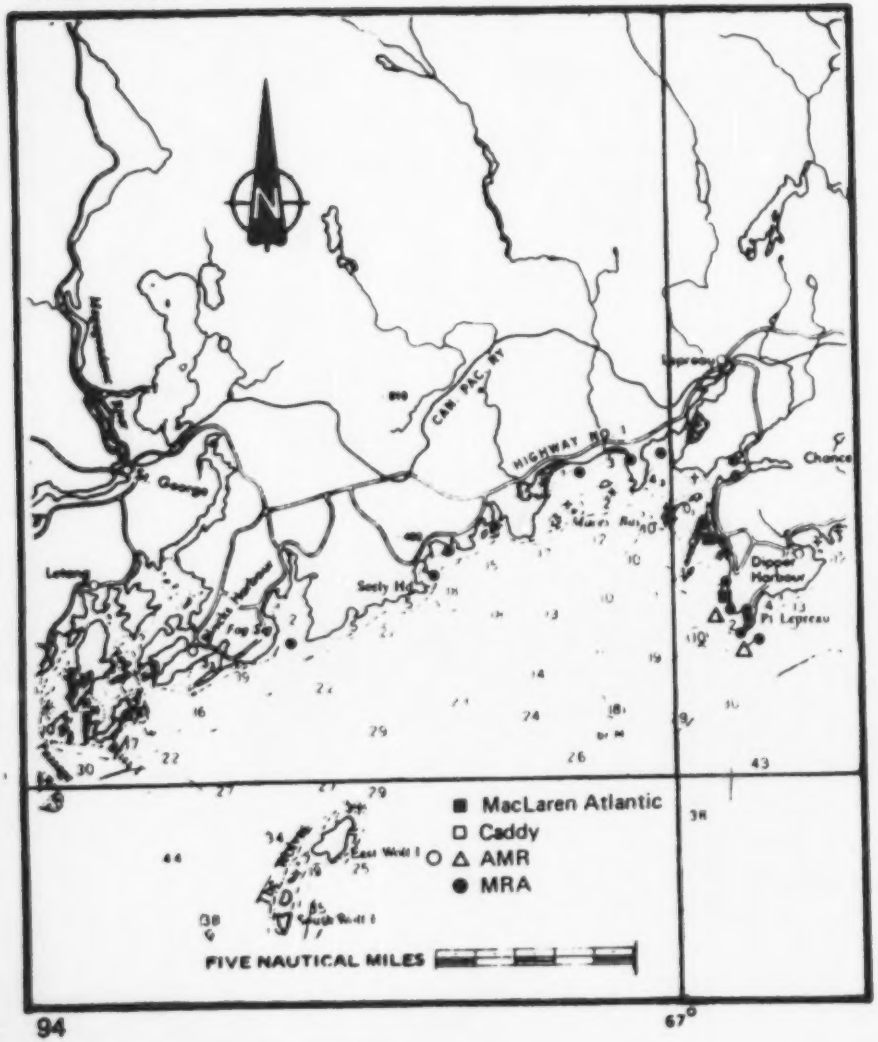
Description - A small branching pink alga with small hard calcareous sections.

Habitat - Occurs intertidally and subtidally, usually on rock.

Distribution and Abundance - (Figure 7.26.6) -MRA (28-P, 34-P-C); AMR (1-P, 2-P).

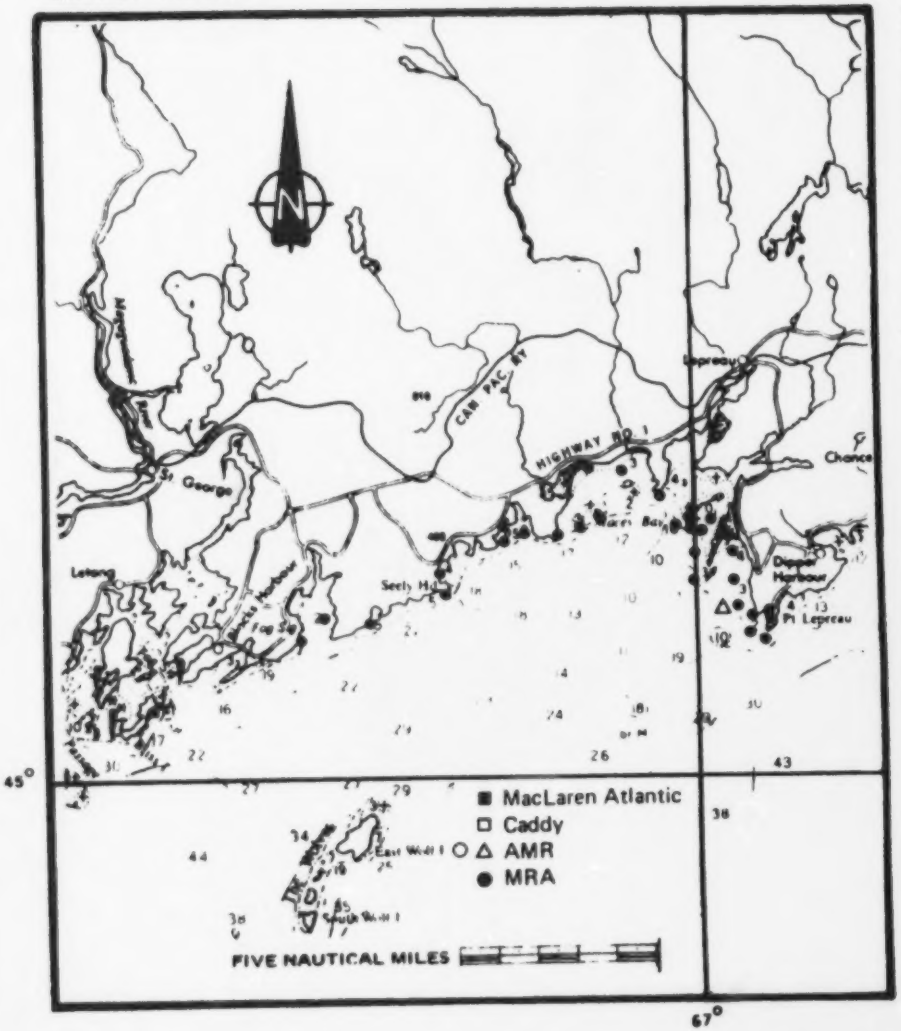
7.26.1
DISTRIBUTION OF
IRISH MOSS

PEA POINT TO POINT LEPREAU



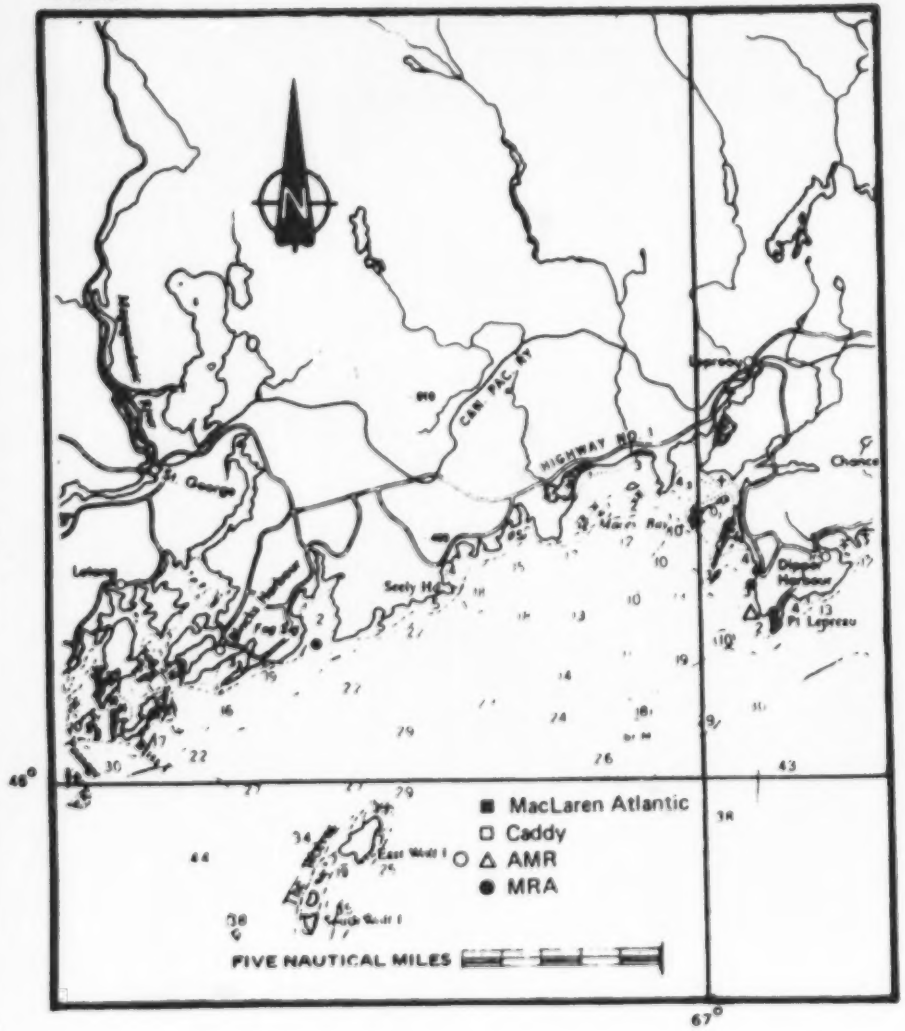
7.26.2
DISTRIBUTION OF
"CORAL" ALGA

PEA POINT TO POINT LEPREAU



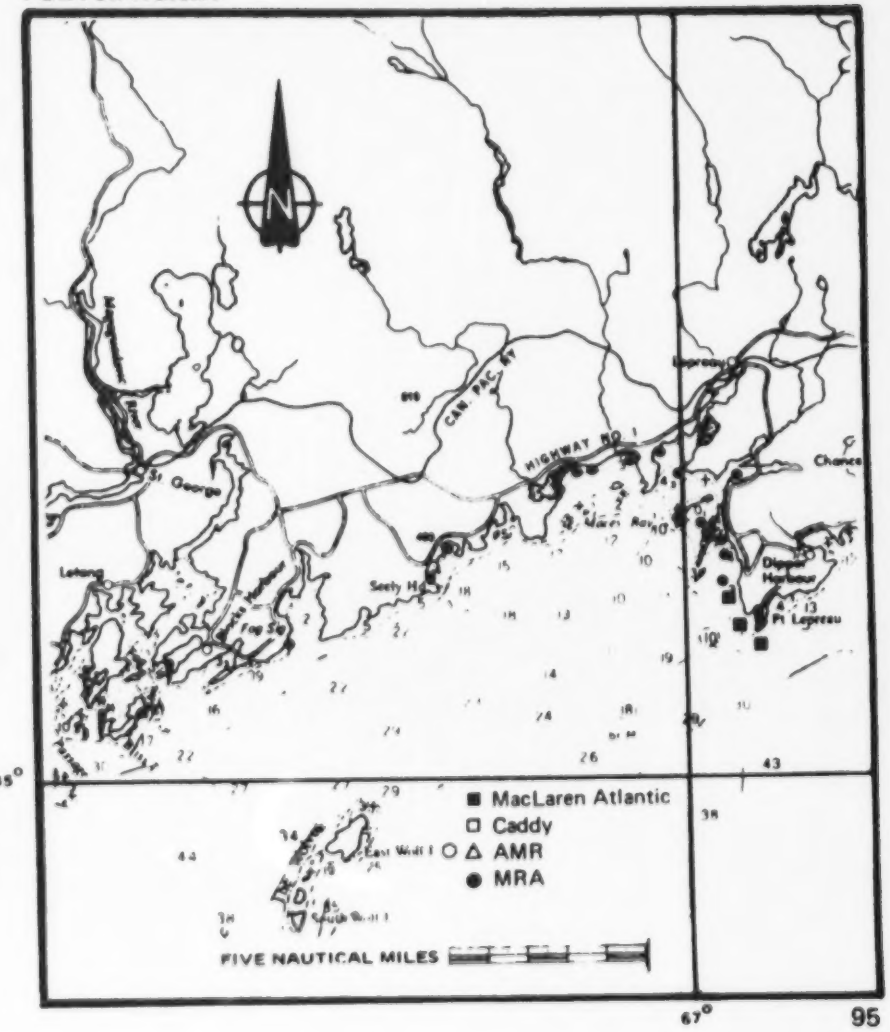
7.26.3
DISTRIBUTION OF DULSE

PEA POINT TO POINT LEPREAU



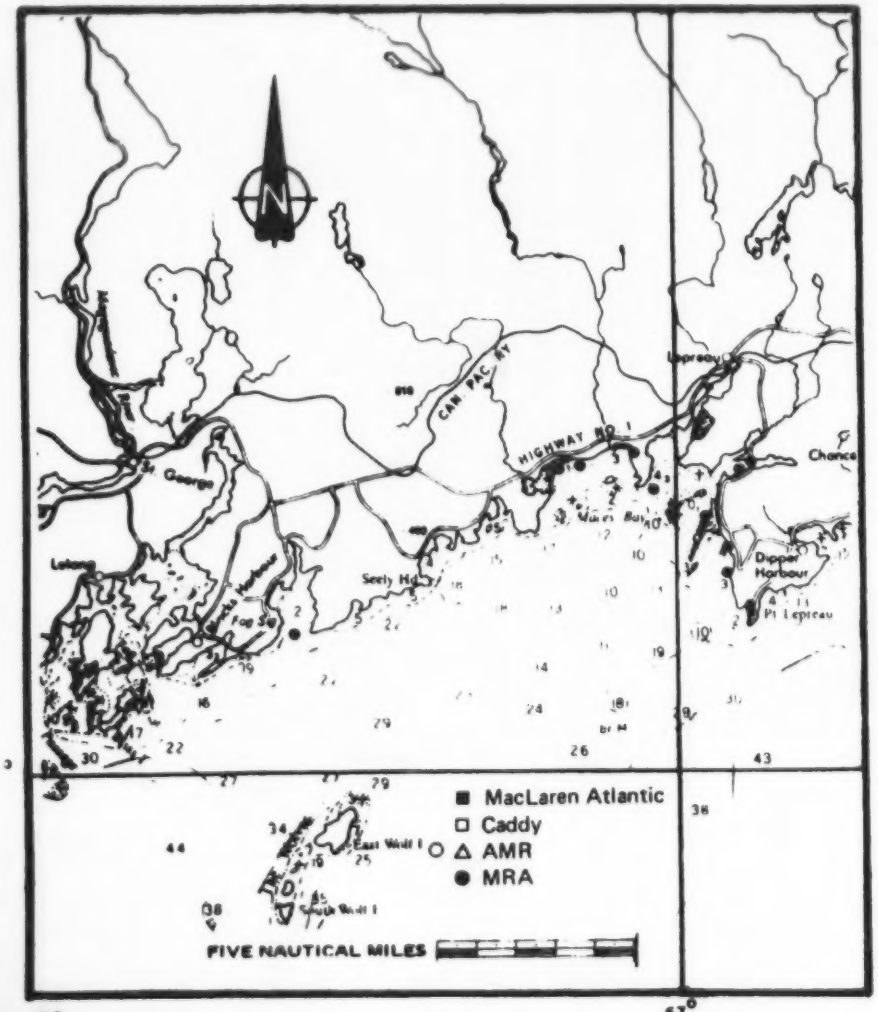
7.26.4
DISTRIBUTION OF POLYSIPHONIA

PEA POINT TO POINT LEPREAU



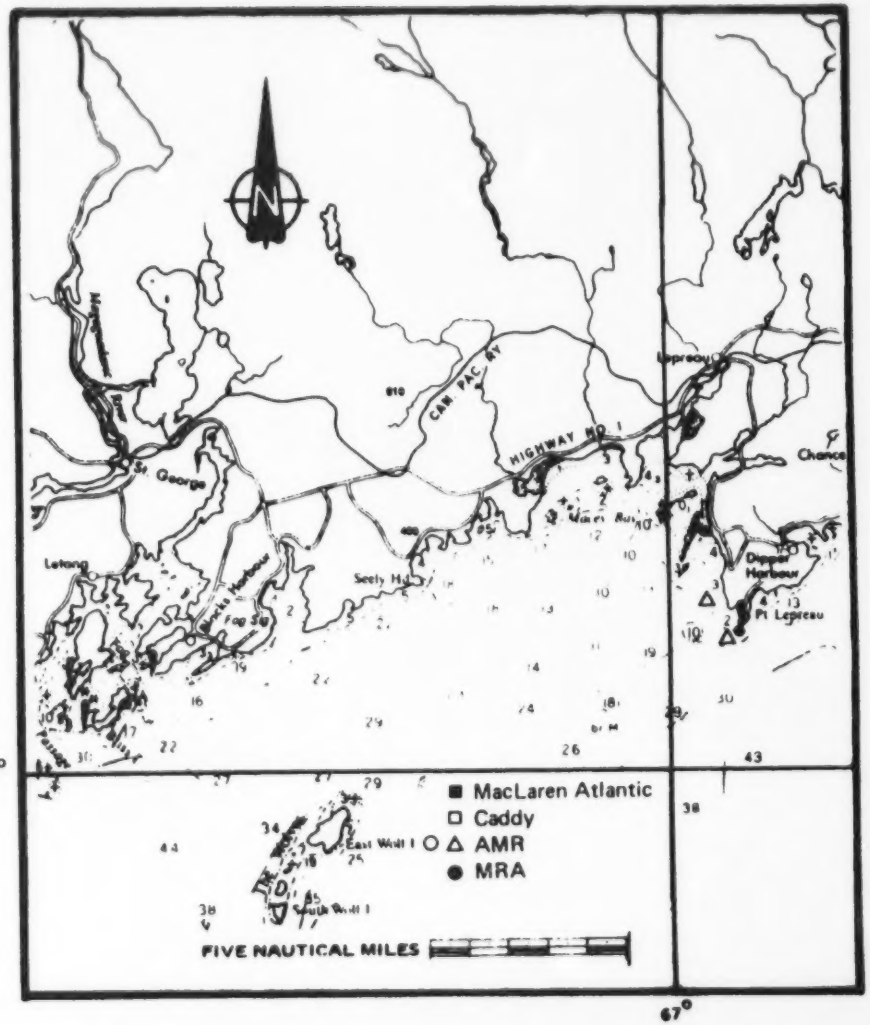
7.26.5
DISTRIBUTION OF
PORPHYRA

PEA POINT TO POINT LEPREAU



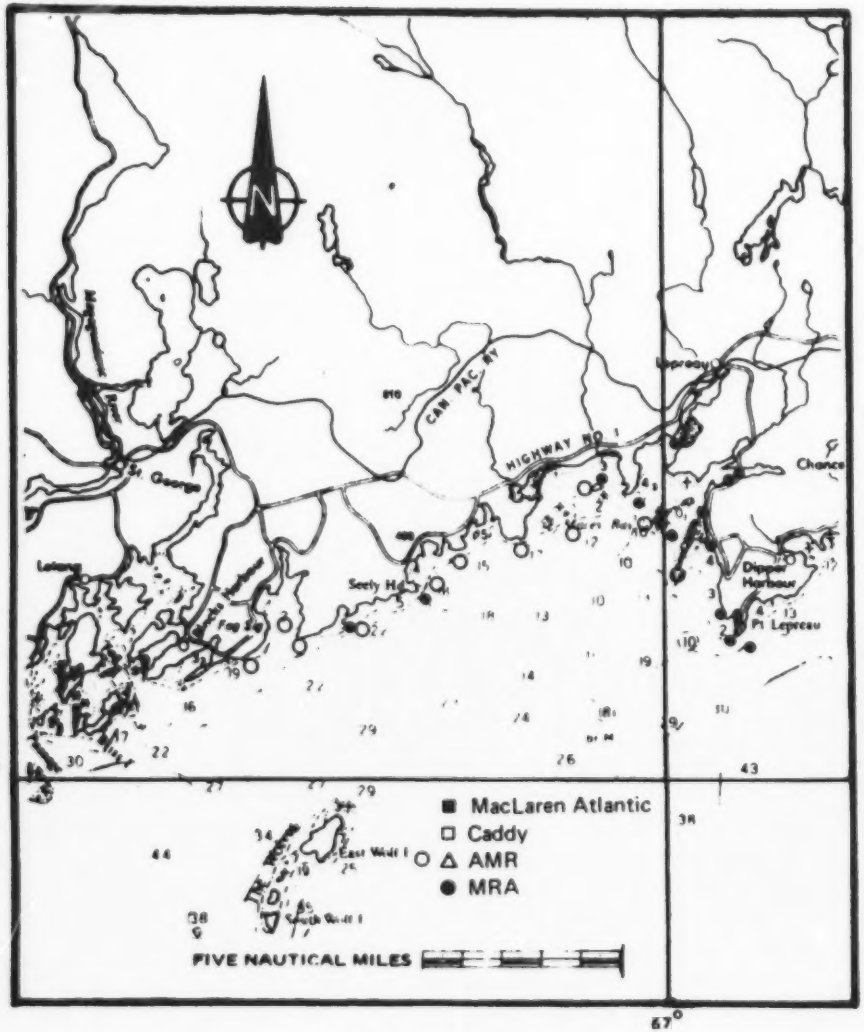
7.26.6
DISTRIBUTION OF
CORALLINA

PEA POINT TO POINT LEPREAU



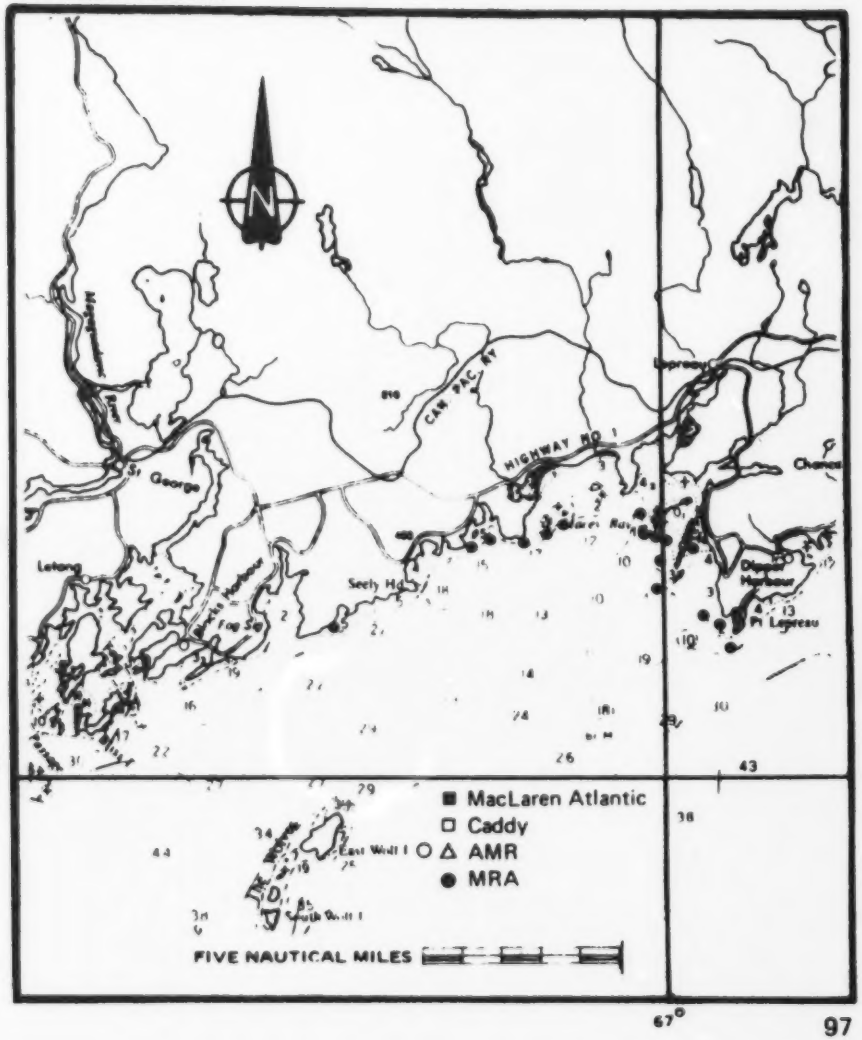
7.26.7
DISTRIBUTION OF KELP

PEA POINT TO POINT LEPREAU



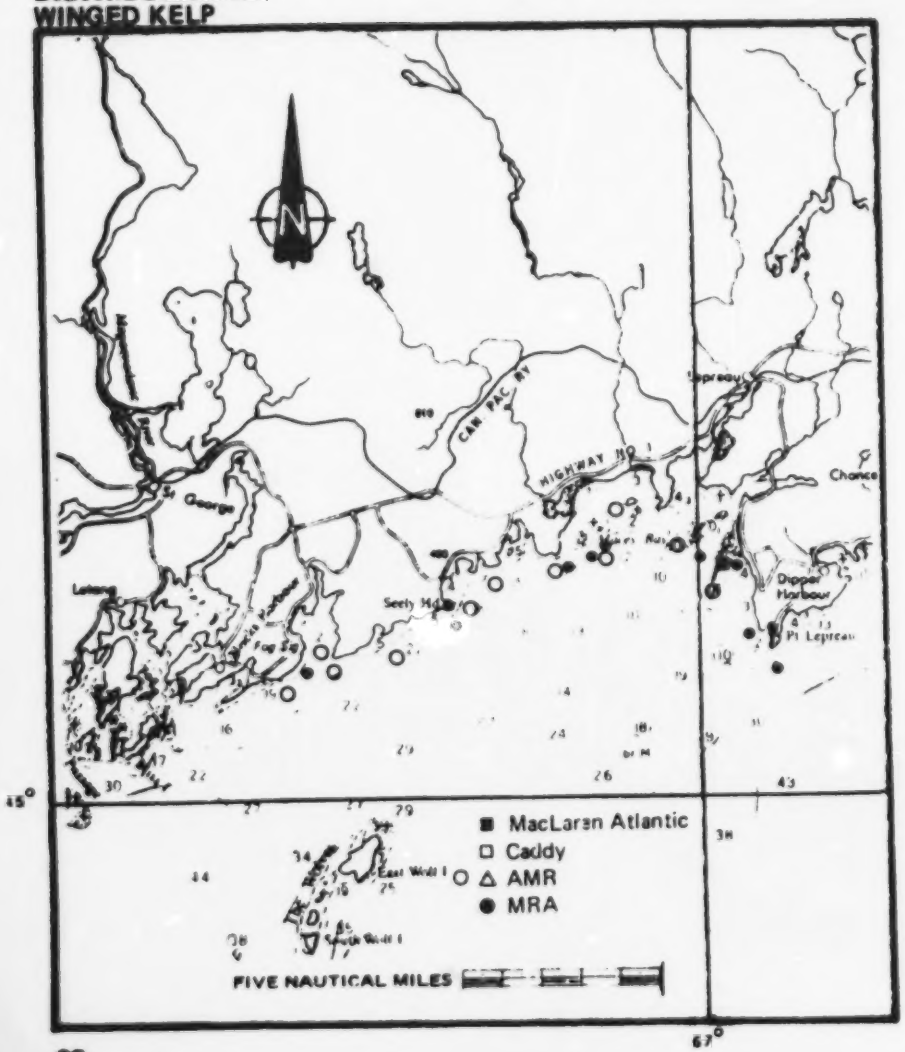
7.26.8
DISTRIBUTION OF SEA COLLANDER

PEA POINT TO POINT LEPREAU



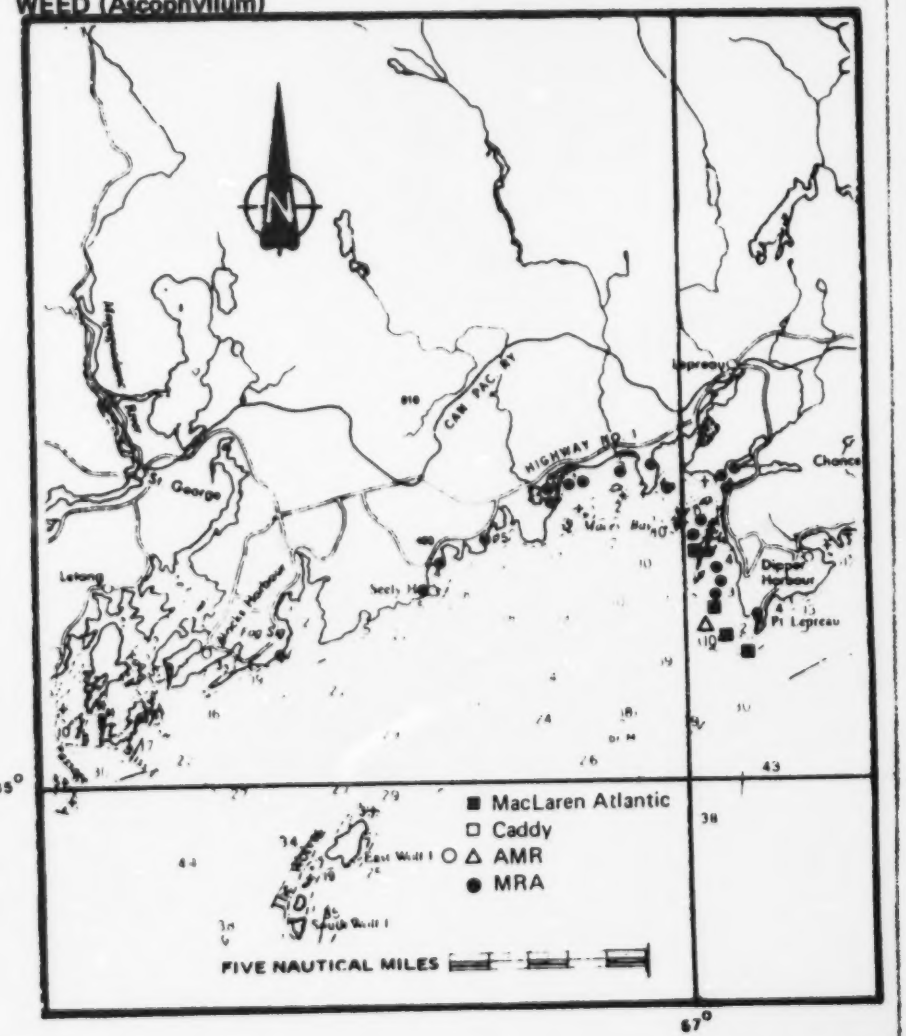
7.26.9
DISTRIBUTION OF WINGED KELP

PEA POINT TO POINT LEPREAU



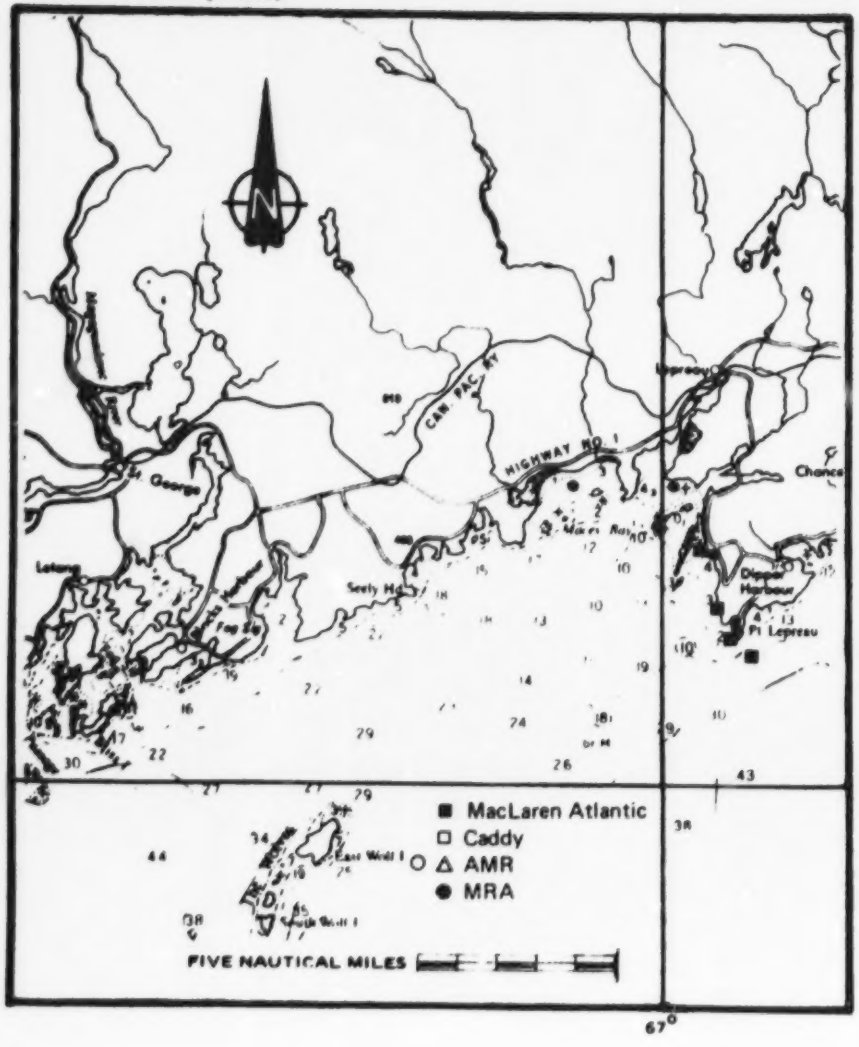
7.26.10
DISTRIBUTION OF ROCK-WEED (Ascophyllum)

PEA POINT TO POINT LEPREAU



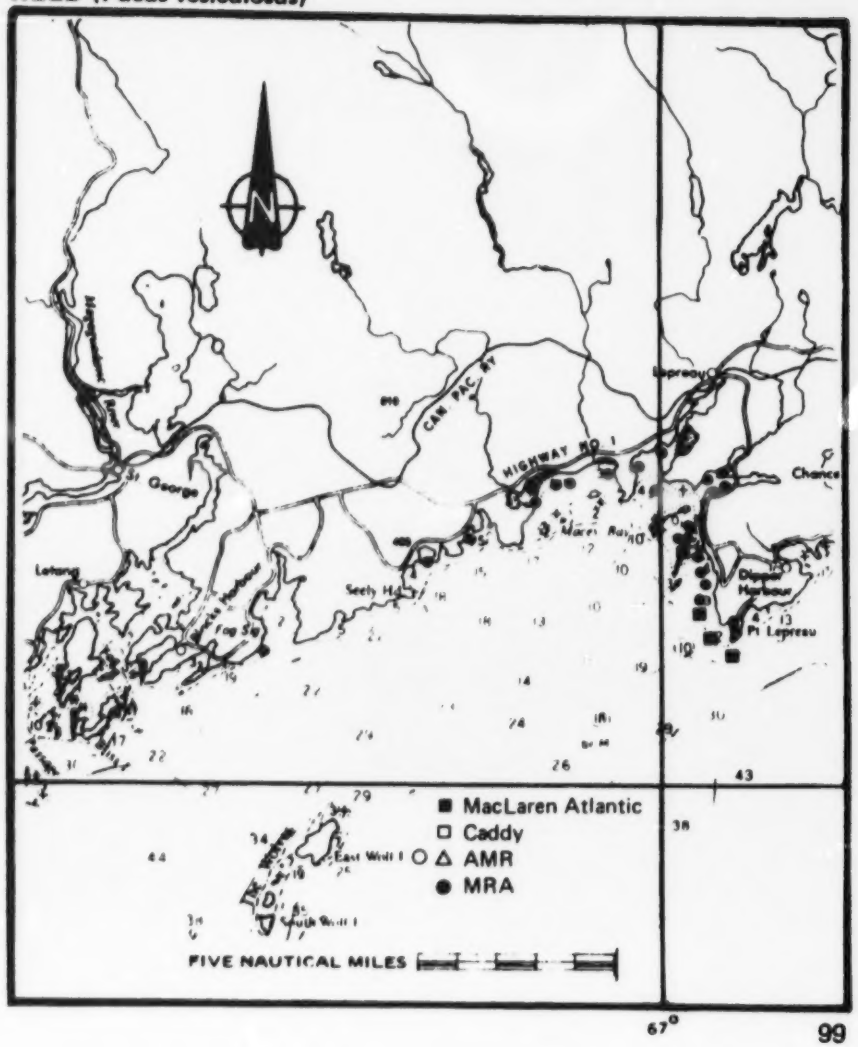
7.26.11
DISTRIBUTION OF ROCK-WEED (Fucus spiralis)

PEA POINT TO POINT LEPREAU



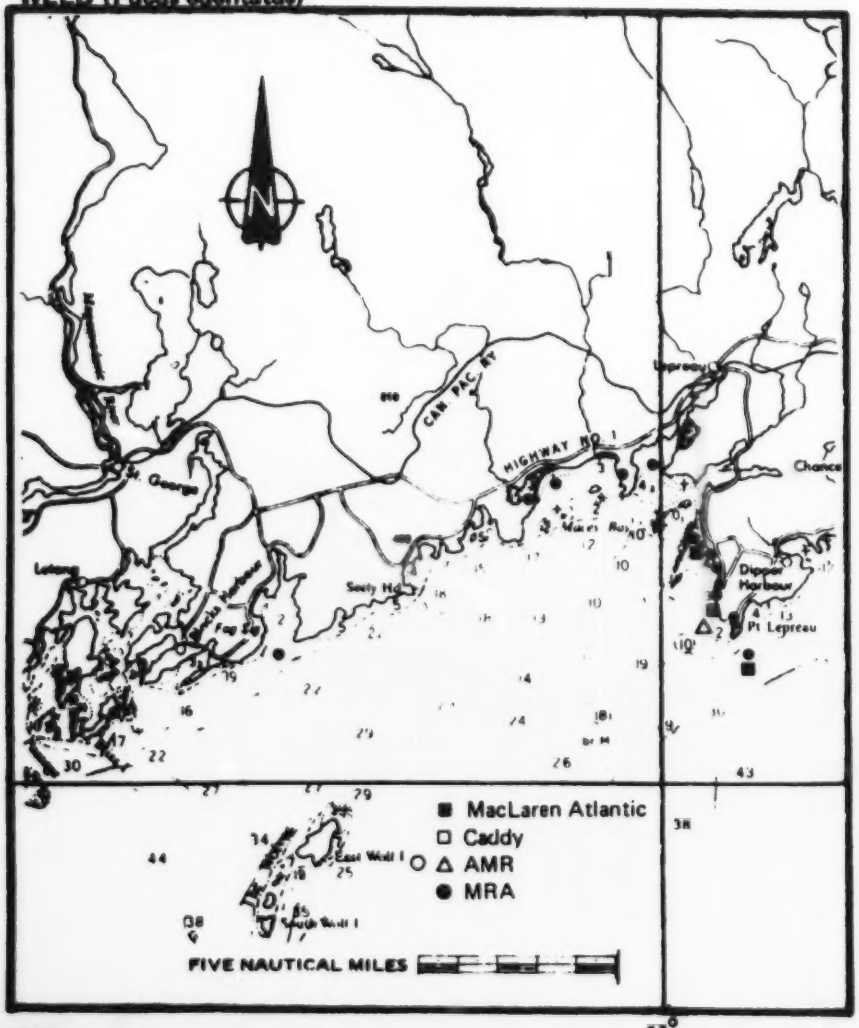
7.26.12
DISTRIBUTION OF ROCK-WEED (Fucus vesiculosus)

PEA POINT TO POINT LEPREAU



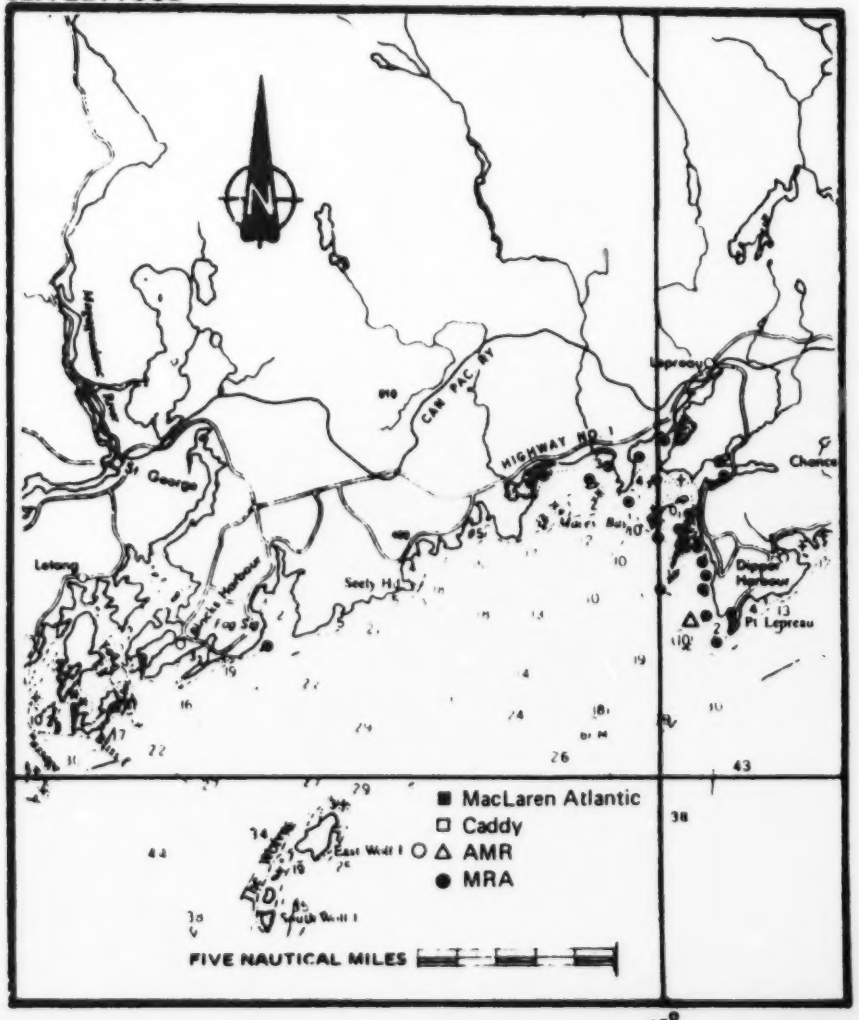
7.26.13
DISTRIBUTION OF ROCK-WEED (Fucus edentatus)

PEA POINT TO POINT LEPREAU



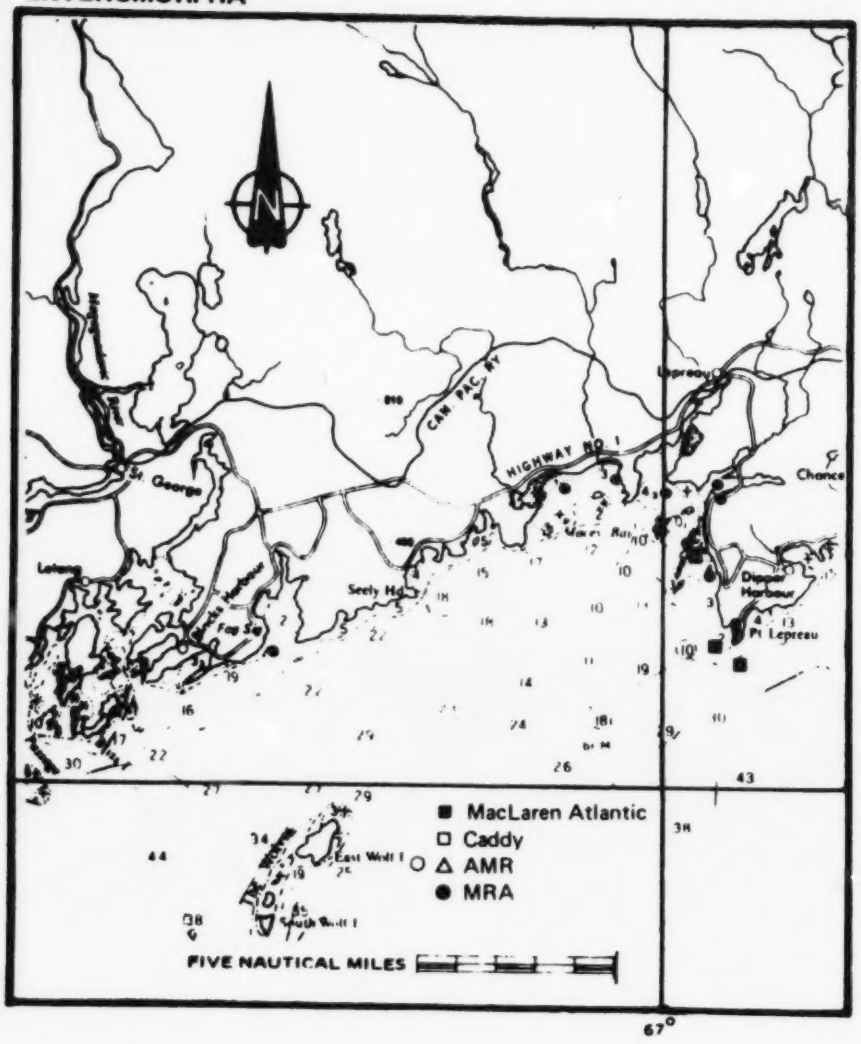
7.26.14
DISTRIBUTION OF SEA LETTUCE

PEA POINT TO POINT LEPREAU



7.26.15
DISTRIBUTION OF ENTEROMORPHA

PEA POINT TO POINT LEPREAU



8. ECOLOGICAL EVALUATION

8.1 INTRODUCTION

The shoreline from Pea Point to Point Lepreau is essentially a rocky exposed coast. However, there are numerous embayments which provide mixed substrates, mud and sand and the biological character of the area is influenced by these physical characteristics. Deep open water lies only a short distance from the shore and, consequently, pelagic fish, birds and mammals occur there; particularly during the summer.

8.2 COMMUNITIES OF THE SHALLOW WATER OR NERITIC ZONE

The shallow water benthic communities of the study area are similar to those found on ROCKY EXPOSED SHORES elsewhere in the Bay. The dominate assemblage of plants and animals grows on rocky substrate. The second most important group is composed of animals which occur on mixed bottom types. Sand and mud dwelling species form a small percentage of the total marine species of the area and are mainly confined to embayments. The breakdown of species in terms of substrate dependence was as follows:

	No.	% of Total Species
Rocky substrate species	45	63.4%
Mixed substrate species	22	31.0%
Sand/mud substrate species	4	5.6%
Totals	71	100%

Figures 8.2.1 to 8.2.5 show typical zonation and modes of occurrence for various substrates in the study area.

An analysis of species in terms of feeding method revealed the following composition:

	% of Total
Plankton/Suspension feeders	49.5%
Detritus feeders	18.3%
Predators/Scavengers	21.5%
Grazers	10.7%
	100%

These figures indicate moderate plankton and detritus levels. Predators and scavengers are near the level for this part of the Bay. Grazers are not relatively common but species occurring in the study area tend to be abundant.

8.3 COMMUNITIES OF THE PELAGIC ZONE

Most pelagic fish, birds and mammals occur in the study area. However, our observations suggest that these species are less common there than at West Isles, Grand Manan and the Wolves.

8.4 COMMUNITIES OF THE DEEP WATER OR BATHYAL ZONE

The benthic fauna of deep water areas in the study area has been poorly studied. However, limited available data indicates that this zone supports a diverse and distinctive assemblage of animals.

Grab samples from soft bottoms in moderate depth were analysed by MacLaren Atlantic Limited (1977) and give some indication of the fauna which can be expected in deeper mud bottom. Species included:

WORMS	*Brada villosa*
	Nephthys incisa
	Ninoe nigripes
	Sternaspsis scutata
	Terebellides stroemi
	Rhodine loveni
	Melinna cristata
	Myriochele heeri
	Scolecolepides viridis
	Ampharete acutifrons
	Aricidea suecica
	Goniada maculata
	Lumbrinereis fragilis
	Tharyx acutus
ARTHROPODS	*Casco bigelowi*
	Diastylis quadrispinosa
	Corophium crassicorne
	Cyathura polita
	Haploops tubicola
	Unciola irrorata

MOLLUSCS	*Crenella glandula*
	Astarte undata
	Cardita borealis
	Nucula proxima
	N. delphinodonta
	Nuculana tenuisulcata
	Periphoma fragilis
	Cerastoderma pinnulatum

Offshore data collected by Caddy (1970) from scallop catches is a further indication of the diversity of organisms which can be expected in deep water off Point Lepreau. Species recorded include:

PORIFERA	*C liona vastifica*
	Polymastia sp (2)
	Weberella bursa
	Haliclona sp.
	H. oculata
	H. Urceola
	Isodictya deichmannae
	I. palmata
	Orina arcofera
	Myxilla incrustans
	Tedania suctoria
	Iophon scandens
	Yvesia sp.
	Plocamionida ambigua
	Mycale lingua
	Halichondria sp.
	Halichondria panacea
	Suberites ficus
COELENTERATES (Cnidaria)	*Tubularia sp.*
	Diphasia fallax
	Sertularella polyzonias
	Thuiaria longchitis
	Halecium muricatum
	Gersemia rubriformis
	Urticinia crassicornis
ANNELIDA	*Polydora sp.*
	Thelepus cincinnatus
	Potamilla reniformis
	Spirorbis borealis
	Protula tubularia
	Potamilla reniformis
	Dodecaceria concharum
	Amphitrite cirrata
	A. affinis
	Harmothoe nodosa
	Glycera capitata
	Eunice pennata
	Euphrosne borealis
	Lepidonotus squamatus
	Aphrodite aculeata
	Sternaspis acutata
	Filograna implexa
ARTHROPODA	*B alanus hameri*
	B. balanus
	B. crenatus
	Pandalus borealis
	P. propinquus
	Spirontocaris groenlandica
	Homarus americanus
	Pagurus acadianus
	P. kroyeri
	Lithodes maia
	Hyas coarcticus
	Cancer irroratus
MOLLUSCA	*Anomia aculeata*
	A. simplex
	Leda tenuisulcata
	Chlamys islandicus
	Mytilus edulis
	Modiolus modiolus
	Musculus subtriata
	Cyprina islandicus
	Astarte undatum
	A. subequilatera
	Venericardia borealis
	Cardium pinnatulum
	C. ciliatum

	Pitar morrhuana
	Ensis directus
	Spisula solidissima
	S. polynyma
	Margarites groenlandicus
	Calliostoma occidentale
	Velutina laevigata
	Epitonium groenlandicus
	Polinices heros
	P. groenlandica
	Crucibulum striatum
	Turritella erosa
	Aporrhais occidentalis
	Buccinum undatum
	Neptunea decemcostata
	Colus stimpsoni
	C. centricosus
	Lamellidoris
	Dentalium entale
	Chaetopleura apiculata
	Rossia hyatti
	Octopus bairdii
ECHINODERMATA	*Ctenodiscus crispatus*
	Hippasteria phrygiana
	Leptasterias spp
	L. tenera
	L. littoralis
	Henricia scabrior
	H. eschrichti
	Crossaster papposus
	Solaster endeca
	Pteraster militaris
	Asterias vulgaris
	Grogonocephalus arcticus
	Ophiopholis aculeata
	Ophiura sarsi
	Strongylocentrotus droebachiensis
	Echinarachnius parma
	Cucumaria frondosa
	Psolus phantapus
BRACHIOPODA	*Terebratulina septentrionalis*
BRYOZOA	*Eucratea loricata*
	Bugula sp.
	Caberea ellisii
	Flustra foliacea
	Porella smitti
	Idmonea atlantica
	Crisea eburnea
	Tricellaria ternata
	Electra pilosa
	Tricellaria gracilis
	Dendrobeania murrayana
	Parasmittina jeffreysi
	Canloramphus cymbaeformis
	Hippiproina propinqua
	Hippothoa hyalina
	Fustrella hispida
CHORDATA	*Boltenia ovifera*
	Halocynthia pyriformis
	Ciona sp.
	Myxine glutinosa
	Brosme brosme
	Gadus morhua
	Melanogrammus aeglefinus
	Urophycis chuss
	Anarhichas lupus
	Pholis gunnellus
	Sebastes marinus
	Hemitripterus americanus
	Myoxocephalus octodecemspinosus
	M. scorpius
	Aspidophoroides monpterygius
	Liparis atlanticus
	Heterosomata sp.
	Scophthmus aquosus
	Hippoglossoides platessoides
	Limanda ferruginea
	Pseudopleuronectes americanus
	Lophius americanus

8.5 PRODUCTIVITY

An analysis of productivity in terms of the distribution and abundance of benthic invertebrates indicates a moderate level of productivity (Fig. 8.5.1) compared to the West Isles area and the Wolves.

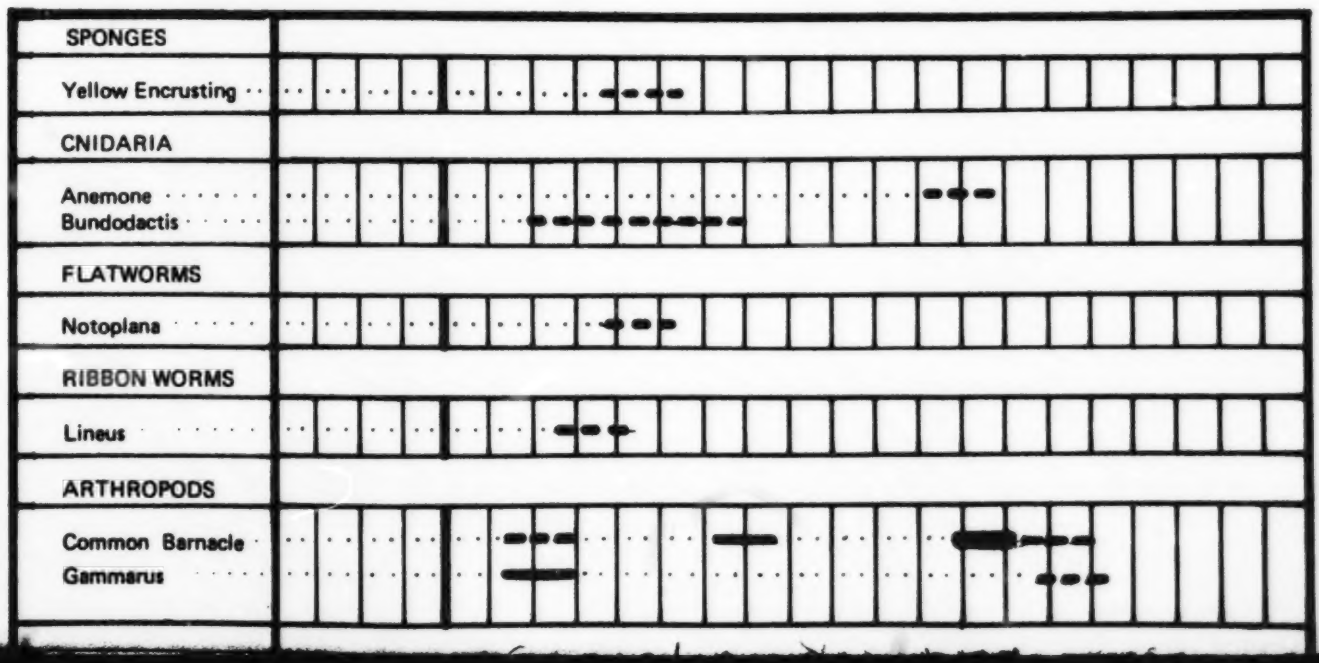

SPONGES
Yellow Encrusting
CNIDARIA
Anemone
Bundodactis
FLATWORMS
Notoplana
RIBBON WORMS
Lineus
ARTHROPODS
Common Barnacle
Gammarus

FIGURE 8.2.1. TRANSECT T1 BEAVER HARBOUR LIGHT HOUSE, N.B.

FIGURE 8.2.2. TRANSECT T2, SEELEY'S COVE, N.B.

FIGURE 8.2.3. TRANSECT T3

FIGURE 8.2.4. TRANSE
T4 - MOLE ISLAND, N.I

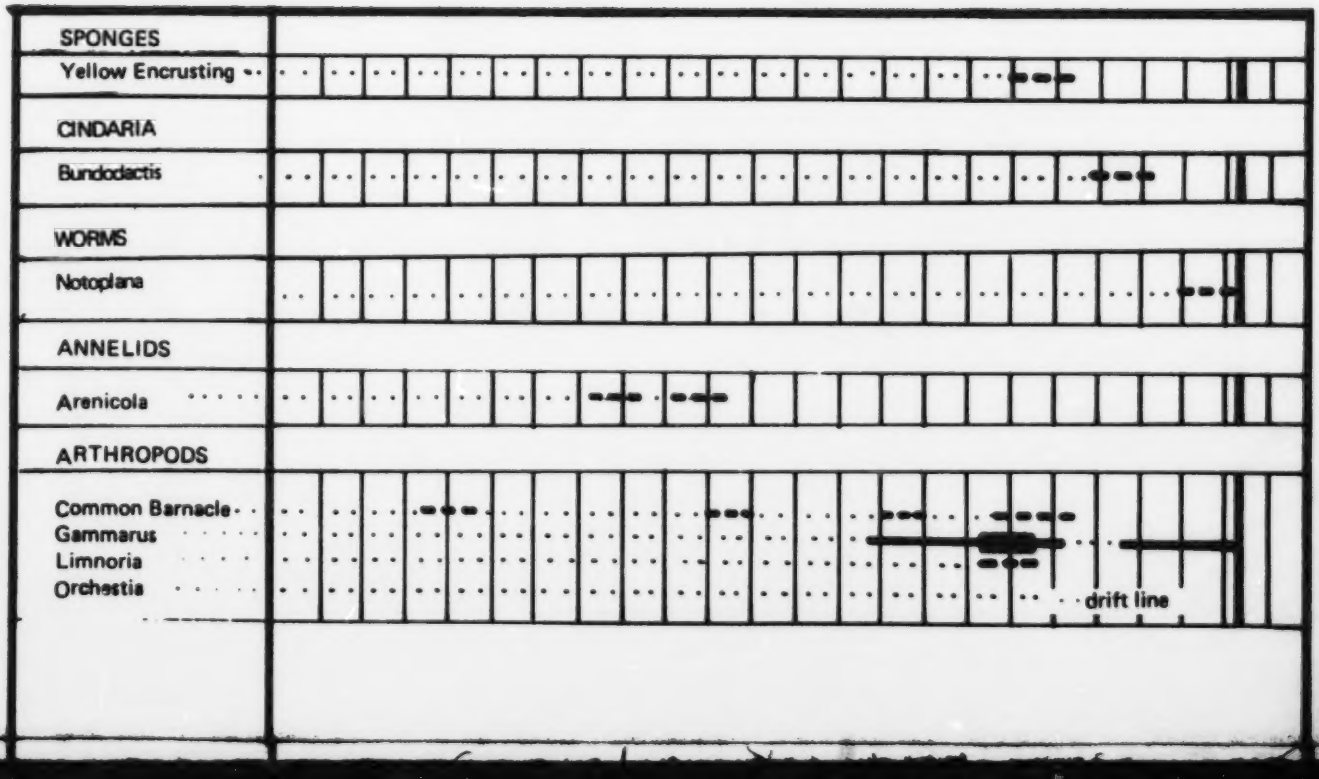
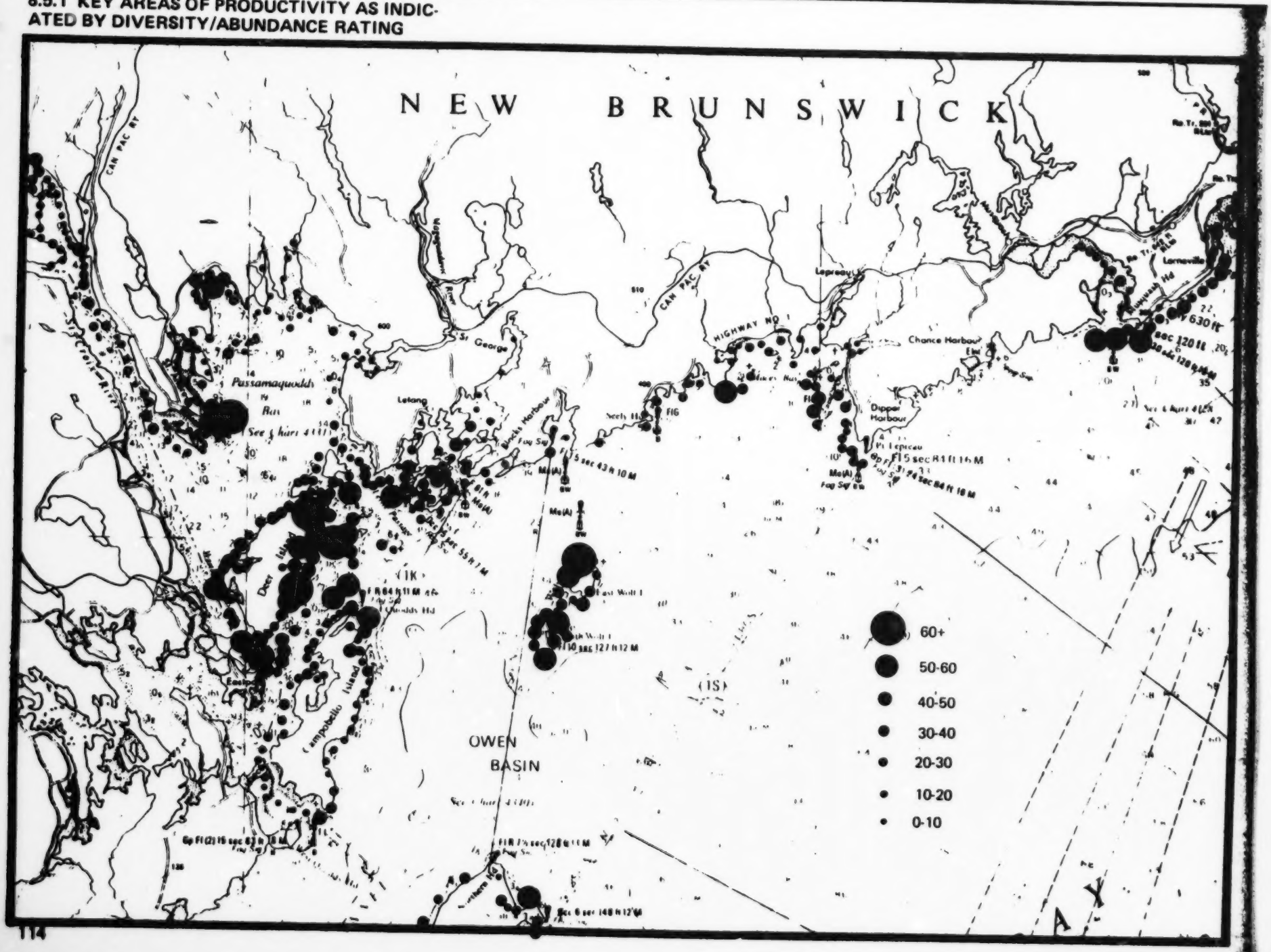

SPONGES
Yellow Encrusting
CINDARIA
Bundodactis
WORMS
Notoplana
ANNELIDS
Arenicola
ARTHROPODS
Common Barnacle
Gammarus
Limnoria
Orchestia
drift line

FIGURE 8.2.5. TRANSECT T5 WELCH COVE, LEPREAU, N.B.

8.5.1 KEY AREAS OF PRODUCTIVITY AS INDICATED BY DIVERSITY/ABUNDANCE RATING



9. THE FISHERY

9.1 GENERAL DESCRIPTION OF THE FISHERY

The main fisheries in the study area are herring, groundfish, clams and lobster. Scallops and occasionally periwinkles, are harvested seasonally to supplement income.

As of March 5, 1977 there were 53 licensed fishermen registered in Statistical District 53 (Fisheries and Marine Service Statistics). This figure does not, however, give a true picture of the entire fishery effort as these statistics do not include unlicensed fishermen or fishermen's helpers. Also Statistical District 53 includes, in addition to the study area, Black's Harbour, Back Bay, L etang, and the Wolves Islands.

9.2 PROCESSING OPERATIONS

The only fish processing establishment in the study area is located at Beaver Harbour.

9.3 PRINCIPAL FISHING AREAS.

Areas which areimportant to the local fishery were documented and are presented in Figures 9.3.1 to 9.3.5.

9.4 ANNOTATED LIST OF SPECIES

INTRODUCTION: Where available, statistics for each fishery are provided. The value of these statistics, however, is questionable since fish caught in one District are often landed in another District. Herring caught in the study area, for example, are often landed at Black's Harbour, Back Bay, or at various locations on the Maine coast. This practice is determined by the location of processing facilities, markets, and the home port of fishermen involved. It must be stressed, therefore, that available statistical data do not reflect the value of any fishery in the study area and reflect only the general level of fishing activity in the Bay of Fundy as a whole.

This flaw in statistical gathering methods has been recognized and programs have been initiated at the Biological Station in St. Andrews, N.B., to document catches statistically in relation to actual catch locality. Presently, this program includes herring (Groom and Iles, per. comm., 1977, 1978) and the offshore fishery (Scarratt, per. comm., 1978). These programs will be of considerable value in the decision making process, particularly as it relates to the establishment of conflicting industrial developments in key fisheries areas.

The following Weir landings for 1977 were kindly supplied by the Marine Fish Division, Department of Fisheries and Oceans, St. Andrews, N.B.

	Herring Landings (tons)
District 49 (Saint John)	97.00
District 50 (Grand Manan)	6741.00
District 51 (Deer Island-6892.00)	8423.00
(Campobello - 1531.00)	
District 52 (Western Charlotte)	1896.00
District 53 (Pea Pt. to Pt. Lepreau)	4445.00
Nova Scotia	5174.00

These data clearly demonstrate the relative importance of the study area in terms of the herring weir fishery.

MOLLUSCA

1. *Littorina littorea* (Common periwinkle) - This is a part-time fishery with sporadic landings. Table 9.4.1 gives recorded landing data for the period 1947 to 1975. Periwinkles are common at a number of localities and occur throughout the study area. Harvesting is done by hand at low tide and some attempts have been made at trapping and dragging (Cook 1976).

2. *Buccinum undatum* (Northern Whelk) - This edible whelk has not been exploited in the study area. It is common but would require further study to determine whether sustained yields would justify a fishery. Elsewhere they are fished using strings of baited traps and are also caught in lobster traps.

3. *Mytilus edulis* (Blue mussel) - The common edible blue mussel is readily available in the study area but suffers from lack of market. Therefore, there are no data for landings. According to Caddy et. al. (1974), *"Problems of market acceptance appear to be the only major drawback to the development of a large and thriving mussel industry in this country"*. They are harvested by hand intertidally, raked or dredged subtidally and can be easily cultured.

4. *Modiolus modiolus* (Horse mussel) - The horse mussel has never been marketed in the Canadian Maritimes (Caddy et. al. 1974), although abundant in the study area. They can be harvested by hand on the low spring tides, dragged subtidally or harvested by scuba divers.

5. *Placopecten magellanicus* (Giant Sea Scallop) - Scallops are common in the study area, but not abundant enough to sustain a large fishery at the present time. Most scallops are harvested in the winter to supple-

ment income. Landings for 1947-1975 in District 53 are shown in Table 9.4.1. Most scallops are harvested by drags with some landings made by scuba divers.

6. *Mya arenaria* (Soft-shelled clam) - The clam fishery is a traditional, though sporadic, fishery. The amount of effort put into this fishery is determined to a large degree by the availability of other species and by the seasonal nature of closures. Landings in District 53 for the years 1947-1975 are given in Table 9.4.1. Caddy and Chandler (1976) have stated that. *"During early 1950's stocks suffered large losses due to what was locally called 'TheGreen Crab Menace' (The shore crab, Carcinus maenas)...the green crab, closures due to pollution, and over fishing, contributed to a steady decline in landings from the early 1950's on. Increased landings in recent years is due to the recovery of the stocks, better markets and better prices to the fishermen".* Clams are harvested manually with a clam hoe but hydraulic harvesters do exist.

7. *Arctica islandica* (Ocean quahog) - There is no existing fishery in the study area and this species has not been utilized commercially in the past. Quahog shells were found at one site and potential is unknown.

8. *Ilex illecebrosus* (Squid) - Although squid are occasionally abundant in the study area, no steady market has developed. For the period 1969-1975 a total landing of 3,690 pounds was reported (in 1976) in District 53 (Fisheries and Marine Service Statistics). Because markets are known to exist,further investigations could be made into this species which is readily caught in large quantities by fish draggers and weirs.

ANNELIDA

1. *Glycera sp.* (Blood worm) - There is an established market for bait-worms. However, their abundance is too limited to produce a viable fishery. Blood worms are usually harvested by hand digging. Caddy and Chandler (1976) report baitworm landings of 4518 lbs. and 8898 lbs. in 1953 and 1954 respectively for District 53.

2. *Nereis virens* (Sand worm) - This species is common in the study area at a limited number of spots. The flats, however, are not extensive enough to support any large scale commercial operation.

3. *Myxicola infundibulum* (Feathered fan worm) - This annelid is currently harvested by MRA for use in research and information on harvesting and marketing can be found in MacKay (1977).

ARTHROPODA

1. *Pandalus borealis* and *P. montagui* (Commercial shrimp) - Both species of shrimp are present in the study area. Although some commercial shrimp fishing has occurred in the past, no fishery exists at present. Table 9.4.1 shows a record of shrimp landings for District 53 for the years 1947-1975. Shrimp are usually caught in specially constructed otter trawls, but some attempts have been made to capture them in rectangular metal traps.

2. *Homarus americanus* (American lobster) - A good commercial fishery for lobster exists in the study area. The landings for District 53 - 1947 to 1975 are given in Table 9.4.1. Lobsters are fished using standard lobster traps during regulated seasons (November 15 to June 24).

3. *Cancer borealis* (Rock crab) - Rock crabs are a common catch in lobster traps in the study area. However, due to lack of market this species is usually discarded. There are no official landings recorded for District 53 but small quantities are taken for domestic use on occasion. Lack of market demand and low landed prices prevent utilization at the present time. Because they are caught along with lobster in the same traps and are handled in any event, a market would produce immediate landings and this potential fishery is worthy of further investigation.

ECHINODERMATA

1. *Strongylocentrotus droebachiensis* (Sea urchin) - As indicated in a survey of the sea urchin roe industry (MacKay, 1976) a good market for sea urchin roe exists. Urchins are abundant in the study area. Urchins are harvested using scallop drags, divers, traps, tassel drags, manual shore collection and surface rakes. 112,235 lbs. of sea urchins were landed in District 53 in 1970 (Fisheries and Marine Service Statistics).

CHORDATA

1. *Squalus acanthus* (Dogfish) - Dogfish are a common species in the study area on a seasonal basis when they become an undesirable part of fish draggers' and weir fishermen's catches. Although used in other countries as a food fish, no markets have been established at present. For the years 1969-1975, dogfish landings for District 53 were as follows: 1970 - 190 lbs., 1972-4, 369 lbs., and 1973-4, 4,574 lbs. (Fisheries and Marine Service Statistics).

2. *Raja sp.* (Skate) - Skate are commonly caught by fish draggers in the study area but no market currently exists.

3. *Clupea harengus harengus* (Atlantic herring) - The Atlantic herring fishery is one of the most valuable fisheries in the study area. Herring landings for District 53 are shown in Table 9.4.1 for 1969-1975. These landings must be looked at with reservation, however, as they clearly illustrate the flaw in statistical information. Included in District 53 are

Beaver Harbour and Black's Harbour and the largest herring processing operations in the Bay of Fundy. Therefore, in addition to herring caught in the district, fish are imported from various other districts as well as from Nova Scotia, the Gulf of St. Lawrence and even the United States to be processed. Also, it should be remembered that herring caught in the study area are often landed in other districts, as well as in the United States. It must be stressed, therefore, that these data do not reflect the level of the herring fishery in the study area but may give an insight into the general level of fishing activity as a whole. In 1977, approximately 24 weirs were in operation in the Pea Point to Point Lepreau area. Herring are also caught in "shut-off seines" and by purse seine.

4. *Gadus morhua* (Cod) - Cod are fished commercially by fish drag, trawl and gillnet in the study area. Fish dragging accounts for the major catches of cod and landings for District 53 for 1969-1975 are given in Table 9.4.1.

5. *Melanogrammus aeglefinis* (Haddock) - Haddock are fished commercially by fish drag, trawl and gillnet in the study area. Fish dragging accounts for the major catches of haddock and landings for District 53 for 1969-1975 are given in Table 9.4.1.

6. *Pollachius virens* (Pollock) - Pollock are taken by fish draggers, trawlers and gillnetters in the study area with draggers accounting for the major catches. Landings for District 53 for 1969-1975 are given in Table 9.4.1.

7. *Scomber scombrus* (Atlantic mackerel) - Mackerel have been an occasional catch in the weirs of the study area and in the past, have been sold for fertilizer or fish meal. Landings for District 53 for 1969-1975 are shown in Table 9.4.1.

8. *Sebastes marinus* (Redfish) - Fish dragging accounts for the major catches of redfish in the survey area. District 53 redfish landings for 1969-1975 are given in Table 9.4.1.

9. *Hippoglossus hippoglossus* (Atlantic halibut) - The Atlantic halibut is occasionally caught by fish drag, (trawl and gillnet) in the study area. Halibut landings for 1969-1975 are given in Table 9.4.1.

10. *Pseudopleuronectes americanus* (Winter flounder) - Occasionally Winter flounders are fished commercially in the study area by fish draggers. Recorded landings for District 53 for 194701973 are given in Table 9.4.1.

11. *Flatfish* (unspecified) - Various other flatfish species are fished commerically in the study area, mainly by fish draggers. Landings in District 53 for 1969-1975 are given in Table 9.4.1.

2. *Hake* (unspecified) - Unspecified species of hake are also occasionally caught in the study area. Available landings are shown in Table 9.4.1 and cover the years 1969-1975.

3. *Brosme brosme* (Cusk) - Only two small cusk landings are recorded for the period 1969-1975: 704 lbs. (1973), 410 lbs. (1974). They do occur in the study area, however, and are an occasional by-catch with the main groundfish species.

4. *Anarhichas lumpus* (Catfish or Atlantic Wolffish) - Table 9.4.1 shows catfish landings in the study area for 1969-1975. Although not plentiful they, too, are an occasional by-catch of the groundfisherman.

5. *Anguilla rostrata* (Eels) - Eels are present in the study area and in 1970 and 1971 there were landings of 254 lbs. and 266 lbs. respectively made in District 53.

6. *Acipenser oxyrhynchus* (Sturgeon) - Sturgeon are infrequently caught by fish draggers and occasionally sighted in the study area. There was a landing of 240 lbs. reported in 1975 in District 53.

ALGAE

1. *Chondrus crispus* (Irish moss) - Irish moss is common in the study area but has never been commercially harvested. According to Neish (1973) "Irish moss was found in quantities far too small to permit commercial exploitation in Charlotte County".

2. *Rhodymenia palmata* (Dulse) - Dulse is present in the study area and, although dulse is harvested in the Maces Bay area, no large scale fishery exists in the study area as a whole. Neish (1973) estimates that the current dulse harvesting industry in Charlotte County is operating at only about 10% of its probable sustainable yield. Dulse landings for District 53 for 1969-1975 are given in Table 9.4.1.

3. *Porphyra sp.* - Porphyra is present in the study area and because of its high market values (in 1973, $32.00 per dry pound, Neish, 1973) is worthy of examination for a fishery or culturing purposes.

4. *Laminaria sp.* (Devils apron) - Laminarians are present to common in the study area but, in our opinion, are not abundant enough to justify a fishery. As well, Neish (1973), in his survey of the distribution of commerically useful algae, does not consider the study area harvestable.

5. *Ascophyllum nodosum* (Rock weed) - Ascophyllum is an abundant species in the study area but no harvesting takes place. The development of a seaweed industry would create a fishery for this species which can be used as rockweed meal.

TABLE 9.4.1 AVAILABLE FISH LANDING STATISTICS FOR DISTRICT 53 (in lbs). (From: Caddy and Chandler 1976; U.S. Environmental Protection Agency, 1976; Fisheries Statistics Branch, Environment Canada).

YEAR	S.S. CLAM	WINKLE	LOBSTER	SCALLOP	SHRIMP	COD	HADDOCK
1947	2,097,000	0	162,000	17,000	0		
1948	3,141,000	0	249,000	20,000	0		
1949	2,633,000	0	200,000	10,000	0		
1950	2,765,000	0	198,000	16,000	0		
1951	3,094,000	0	174,000	9,000	0		
1952	1,998,000	0	360,000	180,900	0		
1953	2,043,500	0	224,000	17,700	0		
1954	924,800	0	179,000	10,500	0		
1955	1,392,000	0	201,000	6,300	0		
1956	1,432,200	0	246,000	5,900	0		
1957	1,223,388	920	209,565	1,841	0		
1958	712,812	3,000	168,402	845	0		
1959	802,500	3,000	146,418	1,320	0		
1960	592,193	7,400	183,062	5,381	0		
1961	606,972	9,000	189,125	8,189	0		
1962	438,915	13,400	146,130	8,368	0		
1963	260,590	17,100	177,006	7,264	0		
1964	395,075	19,030	157,405	5,430	0		
1965	585,500	19,975	112,423	6,175	0		
1966	576,400	16,950	138,790	6,605	0		
1967	493,300	10,200	80,434	5,700	0		
1968	353,109	17,100	95,189	4,150	235,182		
1969	391,106	26,200	145,688	2,300	1,343,197	1,194,368	1,673,643
1970	787,578	36,900	102,291	3,251	198,273	722,099	988,432
1971	1,712,114	18,500	73,277	11,000	200,316	444,005	417,002
1972	1,278,648	6,800	59,006	13,967	139,729	101,984	22,567
1973	1,629,194	9,100	60,091	6,059	27,873	140,905	73,375
1974	518,391	9,650	54,490	5,373	0	80,449	11,902
1975	69,756	3,800	28,918	2,500	0	24,618	34
1976							
1977							
1978							

Note: S.S. Clams: 1968-1974, includes "unspecified" clams - 1975 - 17,000 lbs. S.S. clams and 52,756 lbs. "unspecified" clams

Note: HERRING LANDINGS INCLUDE THOSE MADE AT BLACK'S HARBOUR AND BEAVER HARBOUR PLANTS FROM OTHER DISTRICTS; GROUNDFISH LANDINGS INCLUDE THOSE MADE AT BEAVER HARBOUR FROM OTHER DISTRICTS

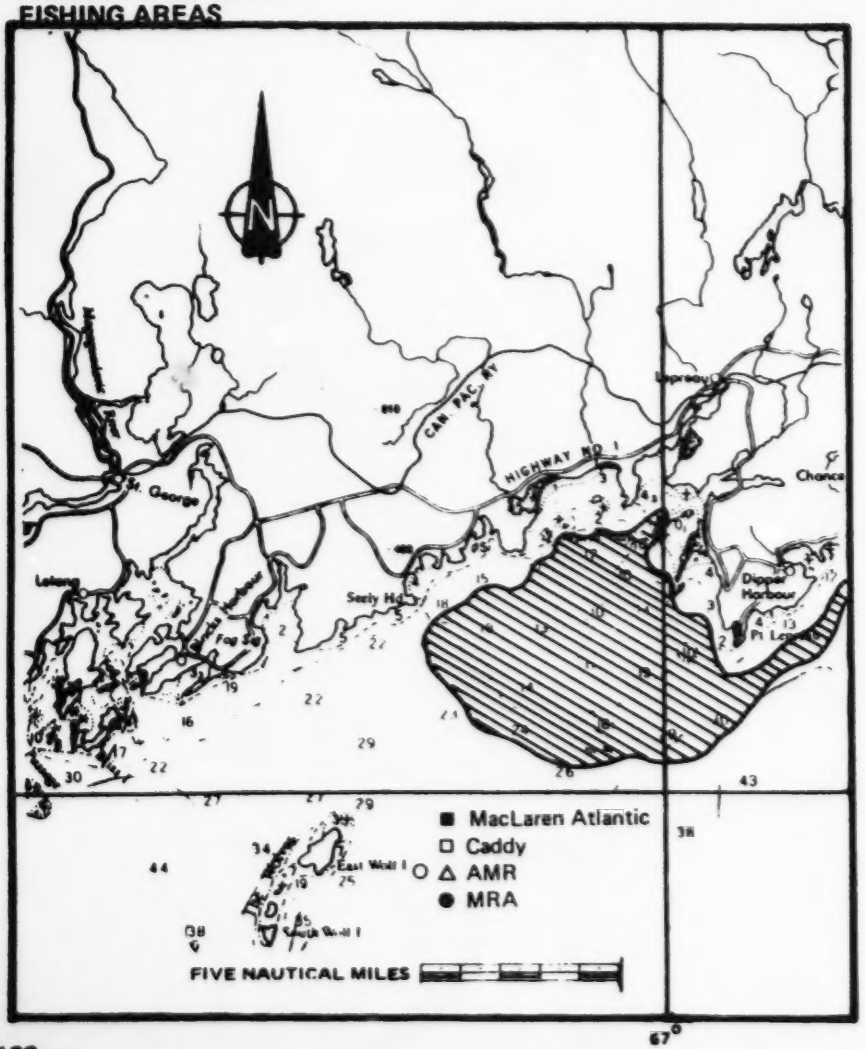
TABLE 9.4.1 (continued)

YEAR	REDFISH	HALIBUT	UNSPEC. FLATFISH	POLLOCK	UNSPEC. HAKE	WINTER FLOUNDER	CATFISH	HERRING	MACKEREL	DULSE
1947						0				
1948						0				
1949						0				
1950						0				
1951						0				
1952						0				
1953						0				
1954						0				
1955						0				
1956						0				
1957						0				
1958						0				
1959						0				
1960						0				
1961						0				
1962						0				
1963						0				
1964						0				
1965						0				
1966						0				
1967						0				
1968						11,439				
1969	121,135	4,313	740,310	846,563	119,740	15,775				
1970	1,176,726	6,368	449,674	612,847	168,105	4,497	49,274	79,658,488	2,200	3,905
1971	1,137,731	1,695	316,040	545,885	193,828	3,300	27,361	63,336,986	30,137	4,313
1972	23,072	0	93,286	11,948	9,990	755	24,410	45,199,134	509,600	2,825
1973	12,243	264	243,620	79,363	31,468	42,926	3,009	46,536,616	44,712	3,400
1974	635	0	6,407	31,231	9,189	1,359	3,471	53,336,409	113,925	3,425
1975	0	123	0	43	1,262		322	62,441,024	4,560	1,570
1976							0	64,644,100	0	625
1977										
1978										

Numbers ending in "000" probably rounded in nearest thousand pounds.
Blanks indicate no information available.

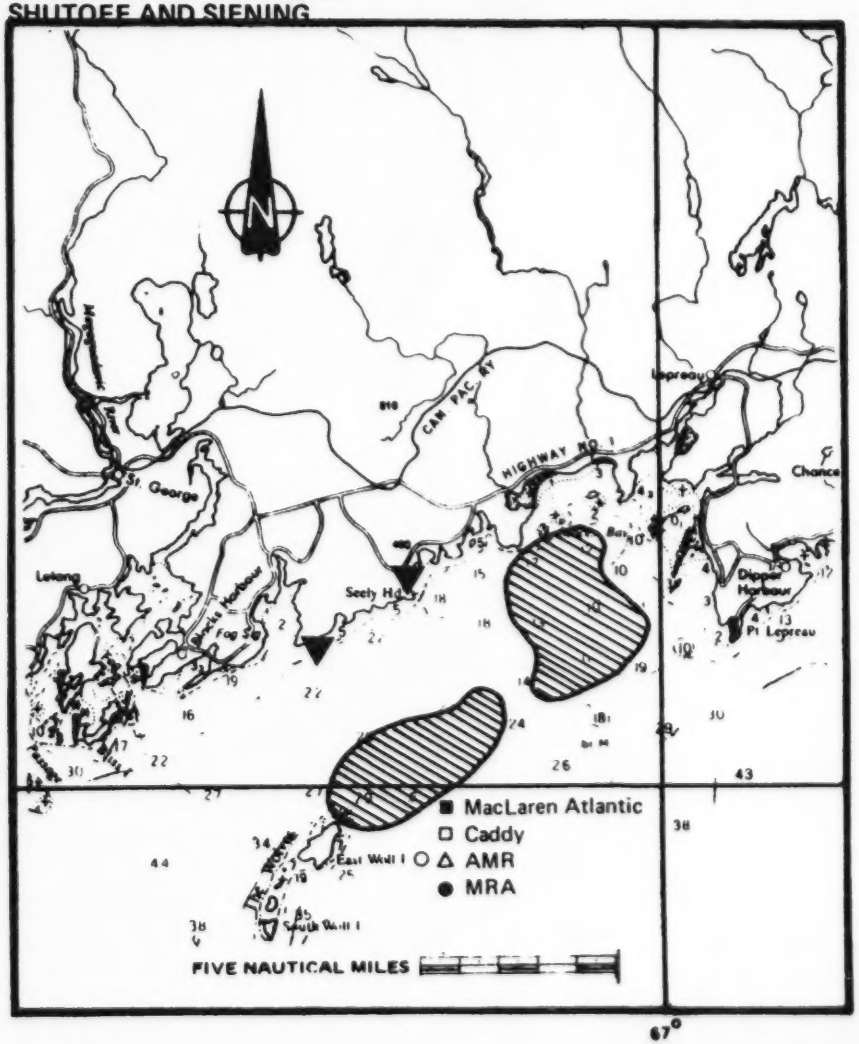
9.3.1
PRINCIPAL SCALLOP FISHING AREAS

PEA POINT TO POINT LEPREAU



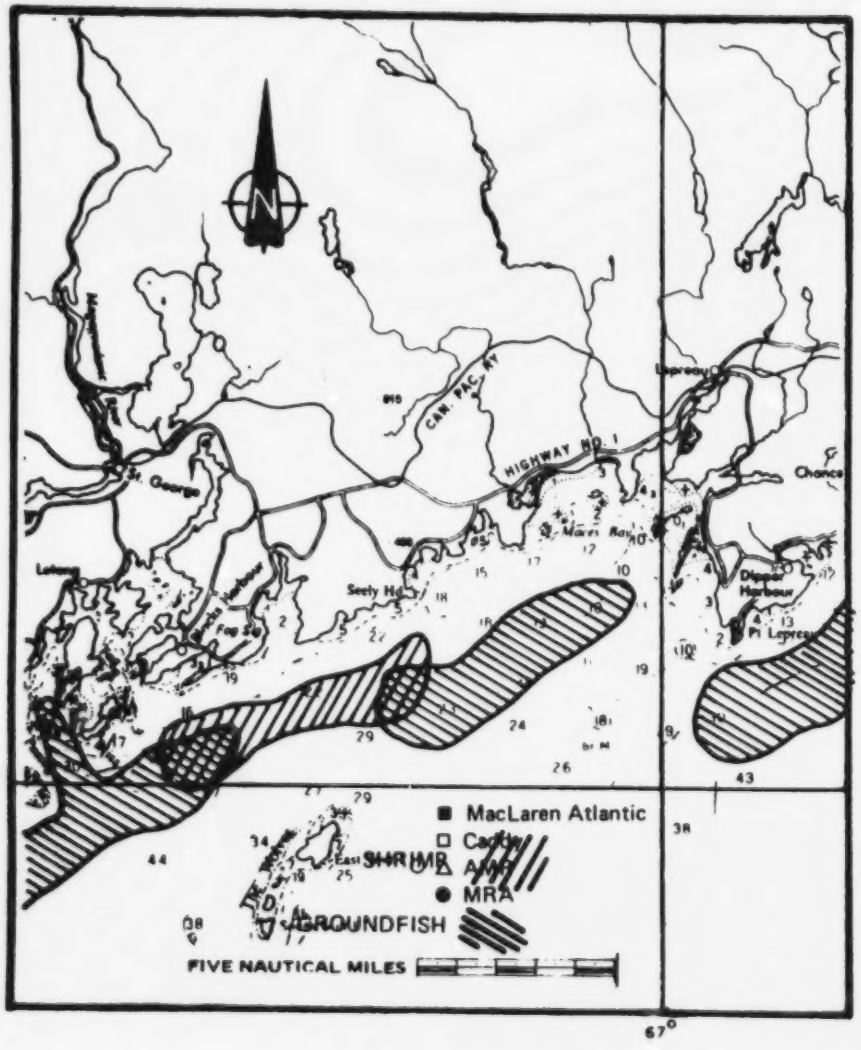
9.3.2
HERRING FISHING AREAS SHUTOFF AND SIENING

PEA POINT TO POINT LEPREAU



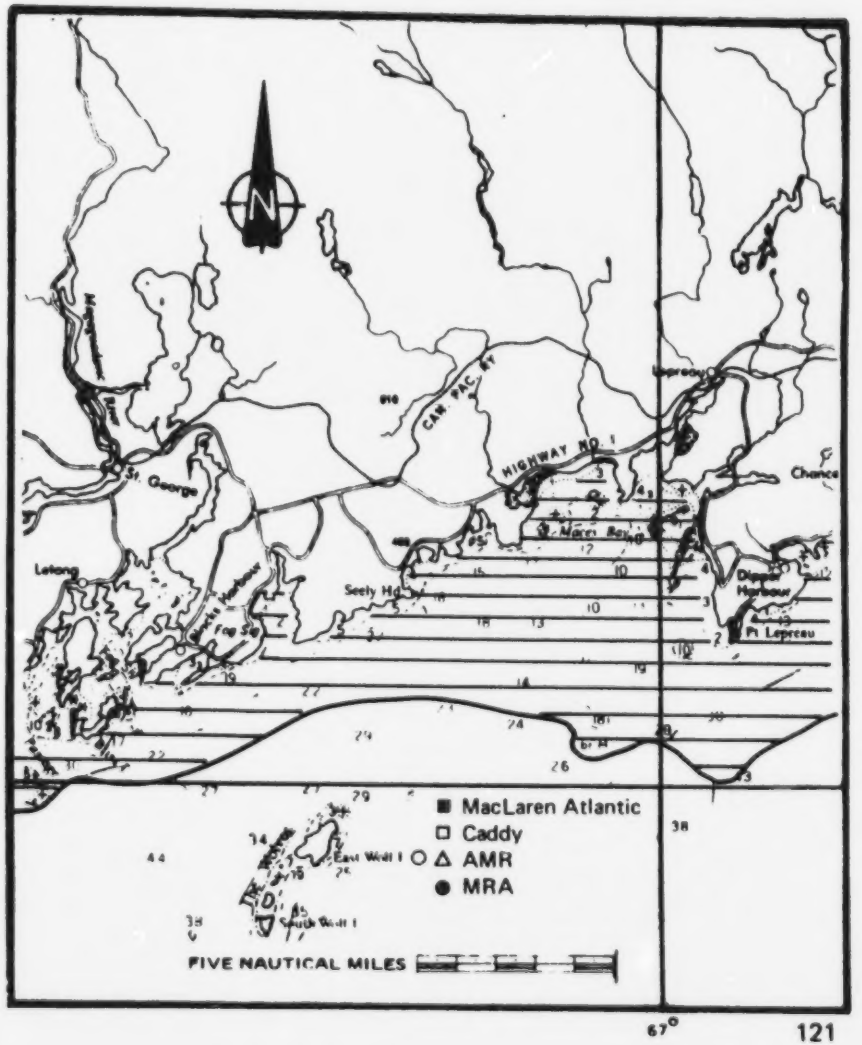
9.3.3
GROUNDFISHING AREAS

PEA POINT TO POINT LEPREAU



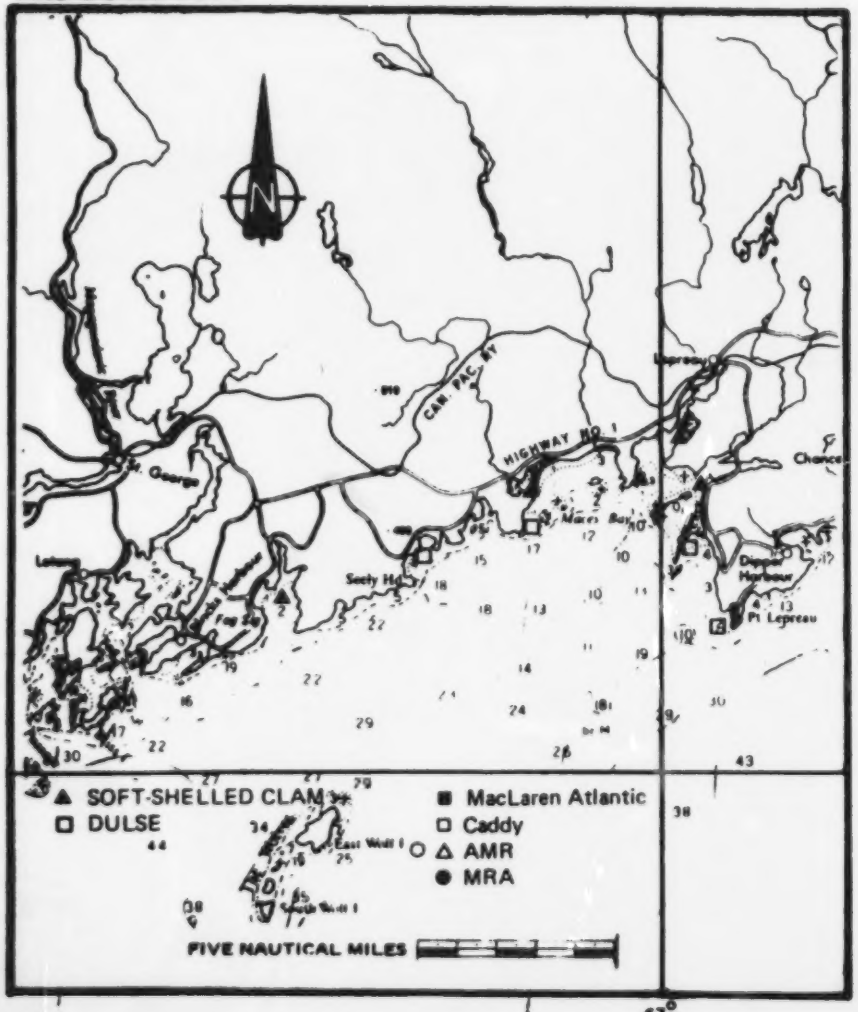
9.3.4
LOBSTER FISHING AREAS

PEA POINT TO POINT LEPREAU



9.3.5
SOFT-SHELLED CLAM AND DULSE BEDS

PEA POINT TO POINT LEPREAU



10.1 ACKNOWLEDGEMENTS. We wish to thank the following individuals for their assistance:

Mr. Nihat Ozerdem, N.B. Dept. of Fisheries
Mr. Kerry Wilson, N.B. Dept. of Fisheries
Mr. Bill Groom, N.B. Dept. of Fisheries
Mr. W. Stewart McKay, MRA
Mrs. A. MacKay, MRA
Mr. R. Balabuck, MRA
Mr. J. Gilman, MRA
Mr. K. Pendleton, Deer Island
Mr. W. Hawkins, Beaver Harbour

10.2 LITERATURE CITED. Only literature referred to in the text is listed here. For additional references to the Area, See Volumes 1, 2 and 3.

Alcock, F.J. MUSQUASH, CHARLOTTE, KINGS AND SAINT JOHN COUNTIES, N.B. Geol. Survey Canada, Map 1084A, 1959.

Applied Marine Research Ltd. BIOLOGICAL FIELD PROGRAM CONDUCTED AS A COMPONENT OF A NUCLEAR POWER PLANT INTAKE STUDY IN NEW BRUNSWICK. For: James F. MacLaren Ltd. 1974.

Bailey, W.B., D.G. MacGregor and H.B. Hachey. ANNUAL VARIATIONS OF TEMPERATURE AND SALINITY IN THE BAY OF FUNDY. J. Fish. Res. Bd. Canada 11(1), 1954.

Baxter, M.D. A BACTERIOLOGICAL ASSESSMENT OF POCOLOGAN HARBOUR (Shellfish Area, N.B. No. 12). Environment Canada EPS Survey Report. EPS 5-WP-72-23 H.C., 1972.

Caddy, J.F. RECORDS OF ASSOCIATED FAUNA IN SCALLOP DREDGE HAULS FROM THE BAY OF FUNDY. Fisheries Research Board Tech. Rept. No. 225. 1970.

Caddy, J.F. and R.A. Chandler. HISTORICAL STATISTICS OF LANDINGS OF INSHORE SPECIES IN THE MARITIME PROVINCES 1947-1973. FMS Tech. Rept. No. 639. 1976.

Caddy, J.F., R.A. Chandler and D.G. Wilder. BIOLOGY AND COMMERCIAL POTENTIAL OF SEVERAL UNDEREXPLOITED SPECIES

SPECIES OF SHELLFISH AND CRUSTACEA ON THE ATLANTIC COAST OF CANADA. Fed-Prov. Committee on Utilization of Atlantic Resources. Montreal, Feb., 1974.

Cook, R. PERIWINKLE SURVEY, GRAND MANAN ISLAND. Rept. to N.B. Dept. of Fish., 1976.

Donnelly, J.P. A SANITARY ENGINEERING SURVEY OF SHELLFISH AREAS 9-14, CHARLOTTE COUNTY FROM BACK BAY TO MACES BAY, N.B. August 20-31, 1973. Envir. Canada Surv. Rept. EPS 5-AR-73-13, 1-18, 1973.

Environment Canada. AN APPRAISAL OF THE ENVIRONMENTAL CONSEQUENCES OF THE DEVELOPMENT PROPOSED FOR LORNEVILLE, N.B. Ottawa, 1973.

Fisheries and Environment Canada. HISTORICAL STREAMFLOW SUMMARY ATLANTIC PROVINCES TO 1976. Inland Waters Directorate, Water Resources Branch, Water Survey of Canada, Ottawa, Canada. 1977.

Hachey, H.B. and W.B. Bailey. THE GENERAL HYDROGRAPHY OF THE WATERS OF THE BAY OF FUNDY. J. Fish. Res. Bd. Canada. M.S. Rept. Biol. Station, No. 455. 1952.

MacKay, A.A. THE SEA URCHIN ROE INDUSTRY ON NEW BRUNSWICK'S BAY OF FUNDY COAST. Marine Research Associates for N.B. Dept. of Fisheries. 1976.

MacKay, A.A. MYXICOLA INFUNDIBULUM. VOL. 2 - LABORATORY CULTURE. Marine Research Associates Ltd., Deer Island, N.B., 1977.

MacLaren Atlantic Ltd. PRELIMINARY ENVIRONMENTAL IMPACT STATEMENT - LEPREAU NUCLEAR GENERATING STATION. Report to the New Brunswick Electric Power Commission, 1975.

MacLaren Atlantic Ltd. COMPARISION OF ENVIRONMENTAL FACTORS RELATING TO ALTERNATIVE SITES FOR A NUCLEAR GENERATING STATION. Summary Report to N.B. Dept. of Fisheries and Environment, 1974.

MacLaren Atlantic Ltd. ENVIRONMENTAL ASSESSMENT FOR THE POINT LEPREAU NUCLEAR GENERATING STATION. Report to the New Brunswick Electric Power Commission, 1977.

Neish, I.C. THE DISTRIBUTION OF KELP AND OTHER COMMERCIALLY USEFUL MARINE ALGAE IN CHARLOTTE COUNTY, N.B. Applied Marine Research Ltd., P.O. Box 11, Halifax, N.S.